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Cincinnati 48-Inch Worm-Driven Automatic Milling Machine

EDITORIAL CORRESPONDENCE

Worm drive on spindle is feature—Made in duplex, widened duplex and plain models — Single-pulley drive and intermittent feed—Examples of work done

THE AUTOMATIC milling machine in the 48-in. size, with constant-speed pulley drive, worm-driven spindle and intermittent feed, now being put on the market by the Cincinnati Milling Machine Co., Cincinnati, Ohio, is made in three general types designated as the Duplex, Widened Duplex, and Plain. The duplex machine is shown in front and rear views in Figs. 1 and 2; the plain machine is shown in Fig. 3.

The duplex machine has two spindle-driving units, or headstocks, mounted on the bed, one on each side of the table. It is especially adapted for machining parallel plain surfaces, using face mills. There are also many other applications of the duplex principle calling for the use of cutters mounted on arbors, as will be shown later in this article.

The widened duplex machine differs from the regular duplex in that the bed and table are wider, permitting a greater distance between the spindle ends. This type is used for milling the ends of motor crankcases and similar work.

The plain machine is similar to the regular duplex except that it has but one headstock, the other headstock being supplanted by an arbor support. This type is used for milling with gang cutters and also for end milling with face mills.

These machines are designed on the principle that when they are set up for performing any given milling job, all the members shall be capable of being firmly locked together, forming one rigid unit, with the exception of the spindle, its driving mechanism and the table itself. The table which carries the work is mounted directly on the bed. It is important to note in this connection that the table under all operating conditions remains at a constant height from the floor. This construction makes for ease of operation, particularly when lifting the work on and off the table.

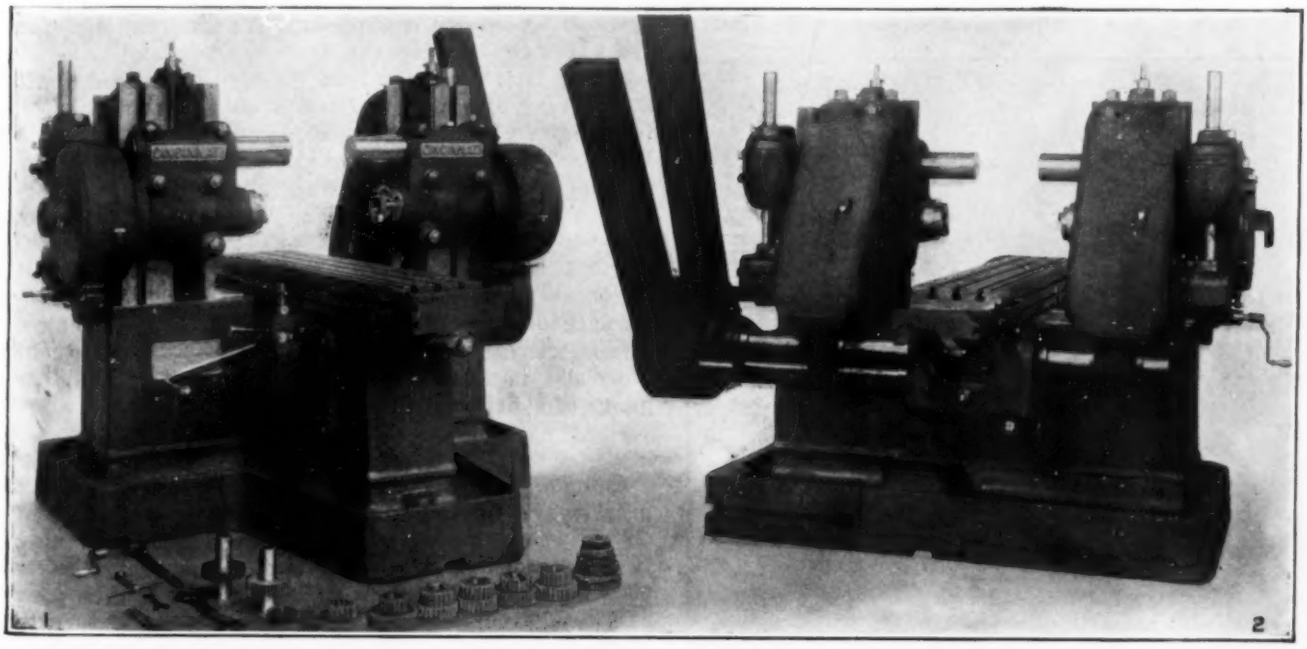
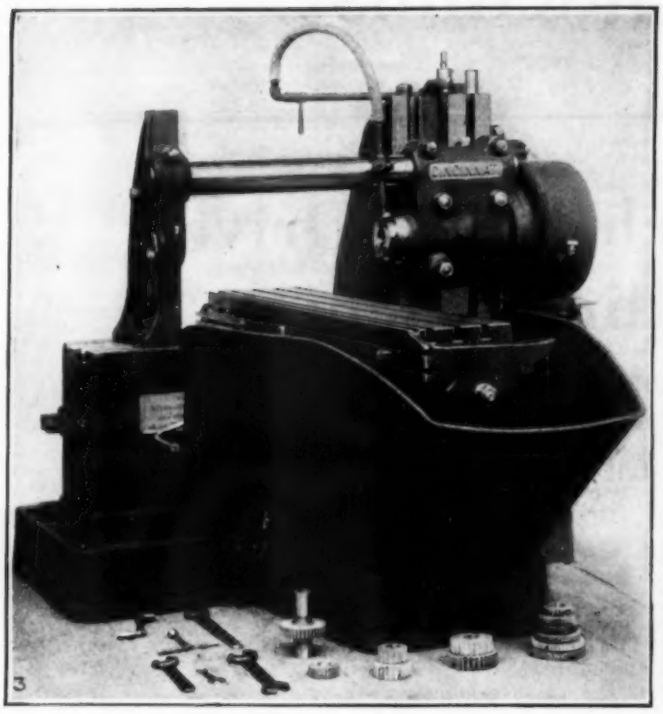


FIG. 1—CINCINNATI 48-IN. WORM-DRIVEN DUPLEX AUTOMATIC MILLING MACHINE. FIG. 2—REAR VIEW OF MACHINE WITH ALL DRIP PANS REMOVED, BUT BELT GUARDS IN PLACE



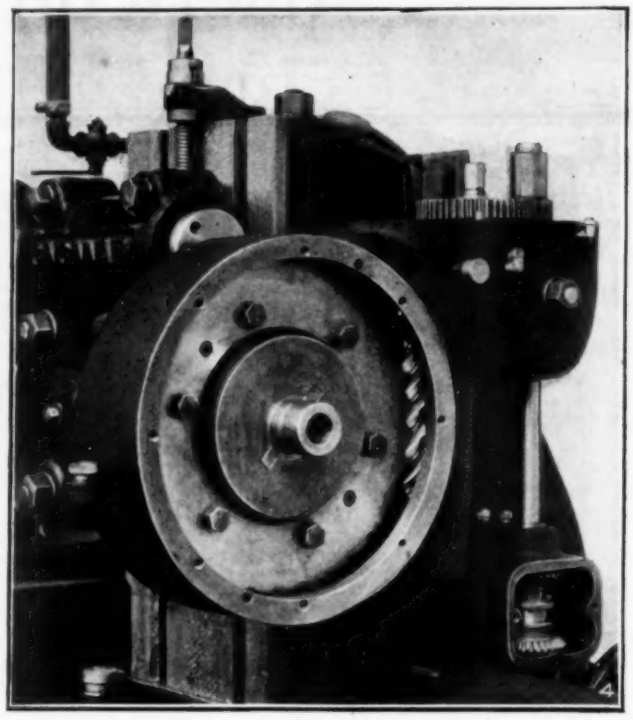


FIG. 3—CINCINNATI PLAIN TYPE OF MACHINE WITH LARGE DRIP PAN IN PLACE. FIG. 4—WORM AND WORMGEAR SPINDLE DRIVING MECHANISM

The bed casting which supports the table also carries the headstocks. These headstocks may be adjusted to or from each other by means of micrometer screws. When properly set the headstocks are solidly bolted to the bed, making for all practical purposes, one solid unit. This construction eliminates the necessity of employing a saddle and does away with one moving member.

The spindle is carried in a rigid bracket which is adjustable vertically on the headstock by means of a micrometer screw. Accurately machined V-guides on both the bed and front face of the headstock insure proper alignment of the movable members.

The base of the machine forms a reservoir for the cutting compound, which is delivered to the cutters in large volume by means of a centrifugal pump. The operating parts of the machine are protected from the wash of the cutting compound, and guards are provided to keep the coolant off the floor under all operating conditions. The arrangement of these guards will be seen by inspecting the various views.

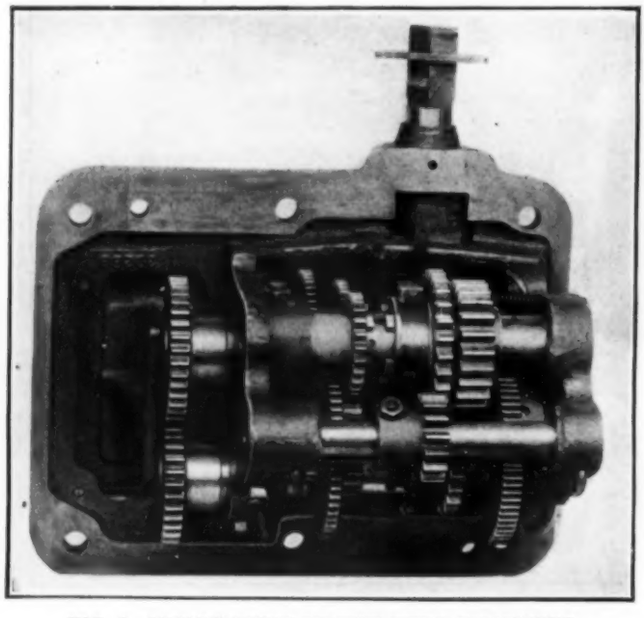


FIG. 5—INSIDE VIEW OF THE FEED-CHANGING GEAR BOX

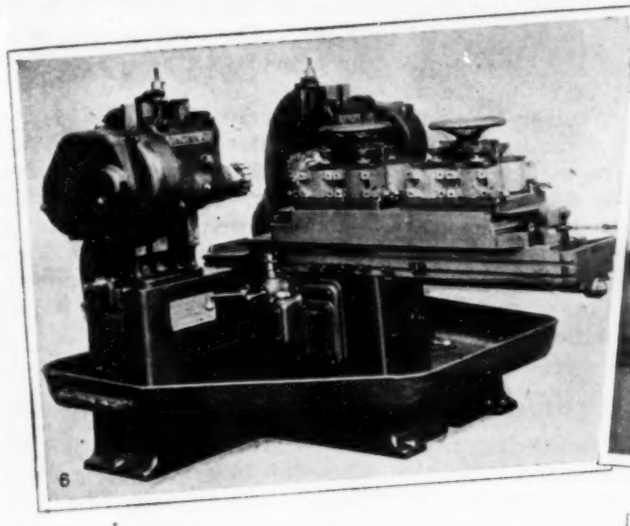
The spindle drive is of the single-pulley, constant-speed type. On the duplex machine one pulley drives both spindles, as well as the feed mechanism. The drive pulley is provided with a friction clutch so that it may be belted directly to the lineshaft. T-slots are also provided at the back of the base for attaching a motor bracket. A special countershaft can be furnished for use where conditions make it necessary.

Power is transmitted from the constant-speed shaft at the rear, through hardened steel gears and shafts, to the worm and wormwheel spindle drive, shown in Fig. 4. The worm used is of the quadruple-thread type, is made of hardened and ground alloy steel, and is carried in a complete ball bearing mounting. The worm wheel is of special bronze and is 15 in. in outside diameter. This type of spindle drive gives a smooth, quiet action even on severe cuts, and thus increases the endurance of the cutters and the life of the machine. The effectiveness of this style of drive is stated to be especially noticeable when using large face mills or gangs of slotting or forming cutters.

Changes of Speeds and Feeds

Spindle speed changes are made by means of pick-off gears. The regular equipment includes three pairs of change gears and two pairs of back-gears for obtaining twelve speeds, which are indicated on an attached reference plate. Changes are made by removing the gear case cover and placing the proper gears on the vertical shafts.

The feed mechanism is so arranged that at the termination of the table feed and at the moment of re-



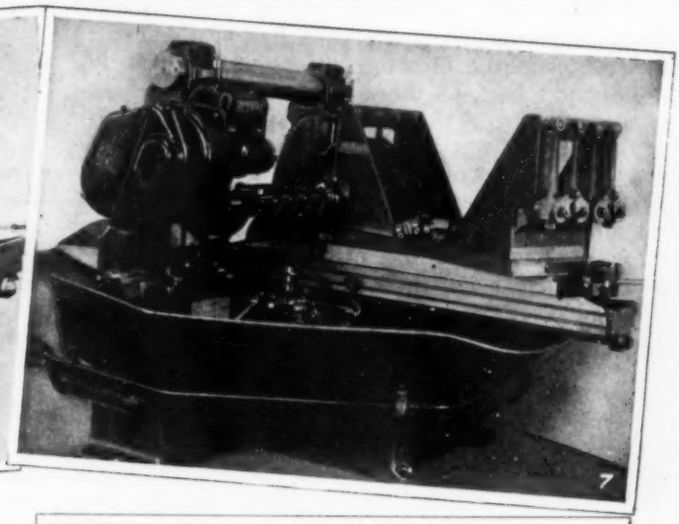


FIG. 6—DUPLEX MACHINE WITH WORK FIXTURE AND STANDARD INDEXING BASE

FIG. 7—MILLING FIXTURE WITH INDEXING BASE PARTLY SWUNG AROUND

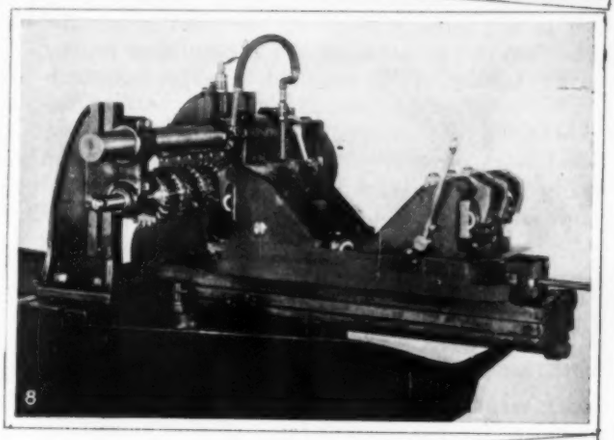
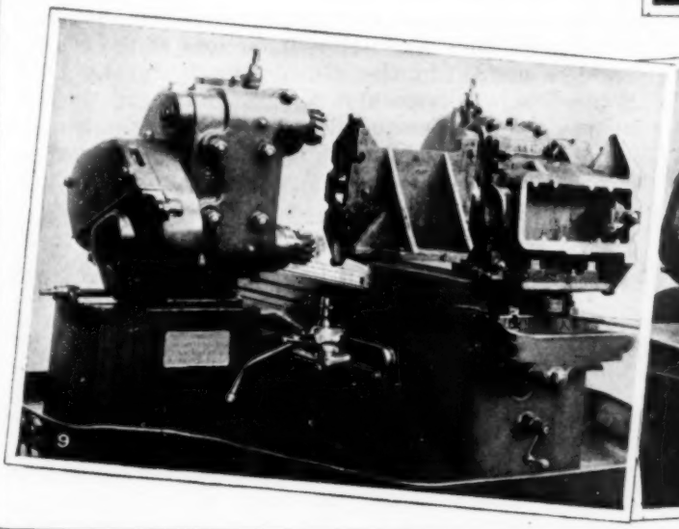
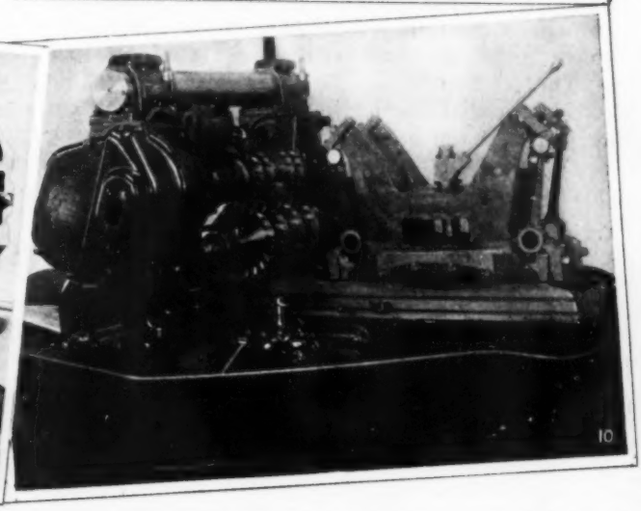


FIG. 8—PLAIN MACHINE USING A GANG OF CUTTERS

FIG. 9—SPECIAL DOUBLE-SPINDLE ARRANGEMENT ON ONE HEADSTOCK

FIG. 10—DUPLEX MACHINE WITH TWO SEPARATELY DRIVEN GANGS OF CUTTERS





versing, the spindle clutch can be automatically disengaged and a brake applied. This construction makes it possible to stop the spindle instantly and hold it stationary during the return stroke of the table. This feature adds to the safety of the operator and improves the quality of the finished work. Provision is made for easily disengaging this automatic spindle stop when the nature of the work is such that it is not needed. A convenient lever enables the operator to run the spindle in either direction.

The lubrication of all shafts and bearing surfaces is made certain by the use of centralized oiling stations. The worm and wormwheel run continuously in a bath of oil.

Stream lubrication for the cutters and work is provided by a centrifugal pump with a capacity of from 12 to 15 gal. per min. This supply is delivered through a ¾-in. pipe to the cutters. The removable splash guards, for confining the spray, are so designed that they allow the operator to stand close to the table. Fast milling speeds and feeds are made possible by this ample cutter flooding system.

The table feed mechanism is controlled by dogs, so as to give practically any combination of fast and slow

feeds forward and an automatic quick return. This feature takes from the operator all the labor incident to the table movements. He does not have cause to worry about running into the cutters when advancing with the rapid feed, as the dogs automatically change to the slow feed. All that the operator has to do is to chuck the piece of work and throw the feed lever. The automatic rapid traverse up to the cutters and the automatic return are made at a constant rate of 150 in. per minute.

Sixteen feed changes are provided through change gears. The inside of the feed box is shown in Fig. 5, the removable change gears being shown at the extreme left. By removing the cover plate to be seen back of these gears, the latter may be removed. Both the gears and the collars at the right of them may be reversed and interchanged, so that each pair of gears furnishes four feeds. The arrangement of the gears for any selected feed is shown on a feed plate attached to the feed box on the machine. When making feed changes it is not necessary to stop the machine, as the feed mechanism can be disengaged by the proper setting of a lever at the back of the machine. The feed mechanism is protected from overload damage by safety devices for both the feed and rapid traverse gear trains.

The total working travel of the table is 48 in. and the working surface is 12 x 59 in. Attention is called to the unusual thickness of the table, giving great stiffness. On the widened-bed type, the table working surface is 19 x 59 in. The overall length of the table is 74½ in. in each case. The duplex machine weighs about 8,500 lb. and the plain machine about 500 lb. less.

Practical Examples of Automatic Milling

A duplex machine set up for milling two rows of cast-iron motor frames is shown in Fig. 6. The cutters have high-speed steel inserted teeth, run at 39 r.p.m., and remove ½ in. of metal with a feed of 7½ in. per minute. The production is 120 pieces per hour. This is a good example of the use of a Cincinnati standard indexing base for the holding fixture. These indexing bases are 16 x 36 in. in size and may be used for a large variety of fixtures. In this case, while the cutters are working on the frames in one holder the operator removes and replaces four frames in the other. As the table runs back, he quickly indexes the holders and swings the rough frames into milling position, and then proceeds to remove and replace four more frames as before.

Another set of holding fixtures mounted on the same kind of an indexing base, is shown partly swung around in Fig. 7. Here drop-forged connecting rods are having the oil dips milled. Four 5½ in. and four 3½ in. diameter cutters are used, running at 59 r.p.m., and the feed is 3½ in. per minute. In this instance a duplex machine is used as a plain machine with only one head working. The time per piece is 0.35 min. The illustration is also a good example of how the drip pans and guards are arranged.

The milling of the ends of main bearing caps on a plain automatic machine is shown in Fig. 8. These caps are drop forgings and ⅛ in. stock is removed. Six 8½ in. diameter inserted-blade side mills on a 2-in. arbor are used, and they run at 38 r.p.m. The feed is 5⅝ in. per minute and the time per piece is 0.18 min. Three caps are clamped simultaneously against the face of the fixture with one movement of a cam lever.

In Fig. 9 is shown a widened duplex machine fitted with a special double-spindle carrier on the left-hand headstock, and it shows how the machine may be modified to meet special problems. The work here is milling the pads on cast-iron crankcases, the cutters used being 7½-in. face mills.

Another interesting special arrangement of a duplex machine is shown in Fig. 10. Here two gangs of cutters mounted on separately driven arbors are used. The upper gang consists of four 7½ in. diameter mills running at 38 r.p.m., and the lower gang is made up of four 11 in. diameter mills running at 25 r.p.m. The connecting rod bosses are milled in 0.67 min. per piece, $\frac{7}{16}$ in. of metal being removed at a feed of 3½ in. per minute.

Promoting Trade with Southern Spain

The decline in sales of American goods in southern Spain is due, in the opinion of Consul William C. Burdett, at Seville, to inadequate observance by American exporters of oft-repeated injunctions regarding commercial dealings with foreign customers, according to *Commerce Reports*. Attention must be given to correct documentation, the proper kind of packing to meet local conditions, the tastes of the population, and promptness in making shipments. English is practically unknown in southern Spain, so catalogs and correspondence in English represent a waste of time and money. Again, in the matter of credits, American exporters have been too prone to go to extremes, occasionally granting either indiscriminate credits or none at all.

A sales campaign in Spain has better chances of success if the country is divided into districts; it is not a unit as a sales area. A personal visit of an official of the firm is highly desirable, particularly in the selection of an agent in southern Spain. The number of distribution centers in different sections of the country would be decided by the selling potentiality of the line in question, which would depend, of course, on the buying power of the surrounding region, the number and standing of the established competitors, transportation, and banking facilities.

Fewer Accidents and Greater Production

By C. R. Hook
Vice-President and General Manager,
The American Rolling Mill Co.

One could very profitably spend several days discussing and illustrating how a proper safety program increases efficiency and production and decreases costs. I don't need a cost sheet or an accountant to tell me dollars have been saved and units of production have been increased when I see the lost time accidents in a plant reduced from one hundred and eleven to three in the same period of time. I have the record of a plant employing 1,291 men. Its lost time accidents have decreased in number from thirty in the month of July to four in the month of February. During the same time the production has steadily increased and in January when they had their best accident record, they broke all the production records of their steel works and finishing mills that had ever been made in the history of the plant. Is this not rather significant and enlightening?

Excerpts from a speech delivered at the National Conference of Business Paper Editors at Middletown, Ohio.

Making the Lawrance Airplane Engine

BY FRED H. COLVIN
Editor, *American Machinist*

Methods of machining the aluminum, air-cooled cylinders — A master connecting-rod with eight smaller rods—A single-throw crankshaft

BEGINNING with a three cylinder, 60-hp. aeroplane engine which proved very successful in small planes for the United States Navy, the Lawrance Aero Engine Corp. of New York, has developed this type of motor into a nine cylinder engine which has given 240 hp. at 1,800 r.p.m. This is the engine with which Lt. A. W. Gorton of the Navy won the Curtiss marine trophy race at Detroit in October, 1922, with an average speed of 112.65 miles per hr. over a course of 160 miles. In reality this speed is somewhat more than appears on the surface as it included not only the time in the air, but the time required to alight on the water, taxi around the judge's barge in a hairpin turn, and take off again on the fifth, sixth and seventh laps, as called for by the rules of the race.

Being an air cooled engine adds interest to its manufacture and the cylinders and other parts properly form the basis for a description of some of the manufacturing methods. The cylinders shown herewith are for the nine cylinder engine and have a bore of 4½ in. by 5½ in. stroke. The compression ratio is 5 to 1 and the engines are rated at 200 hp. at 1,700 r.p.m. The fuel consumption is given as 0.5 lb. per hp.-hr. and that of the lubricating oil as 0.03 lb. per horsepower-hour.

The cylinder is an individual aluminum casting with an integral head in which are cast the bronze valve seats. The valve guides, also of bronze, are pressed into place in the conventional way. The cooling fins are of aluminum and are a part of the cylinder itself. They are made thick enough to be finished on both sides and to a definite thickness so as to give the desired cooling effects on all parts of the cylinder. A heat treated steel shell only $\frac{1}{16}$ in. thick is shrunk into place after the cylinder casting is bored, to form a suitable wearing surface for the piston and its rings.

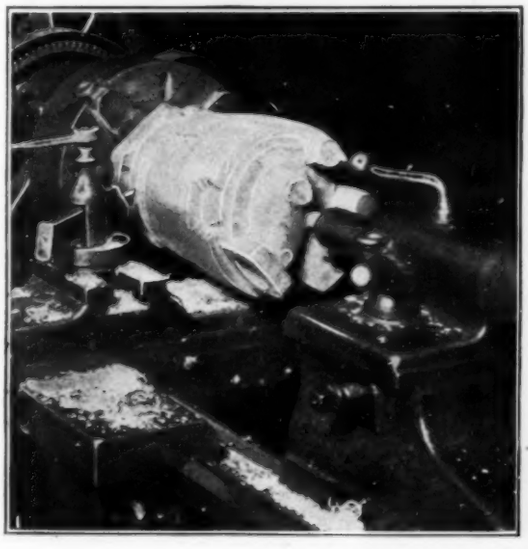
The first operation on the cylinder is to turn two chucking locations on the outside of the air-cooling fins for holding the cylinder casting during the boring operation. The cylinder is chucked from the inside, using the stepped jaws of the chuck both for centering and driving, as shown in Fig. 1. This method centers the cylinders from the bore and also drives it for the turning operation. The other end is centered on a boss attached to the head for that purpose.

MACHINING THE CYLINDER

After the cooling fins have been turned to their proper sizes diameters are carefully measured by a large micrometer set by suitable test bars and the cylinder is then ready for the boring operation, as shown in Figs. 2, 3 and 4.

How the cylinders are held in the special angle chuck *A*, with the arms *B* and *C* which fit over the turned air-cooling ribs and center the casting as well as holding it for the boring operation, is shown in Fig. 2. The clamping arms cover a number of the ribs and so afford a good grip on the cylinders.

The general layout of the cylinder boring job is shown in Fig. 3, which gives a good idea of the tooling of the Gisholt lathe and the way in which the work is handled.



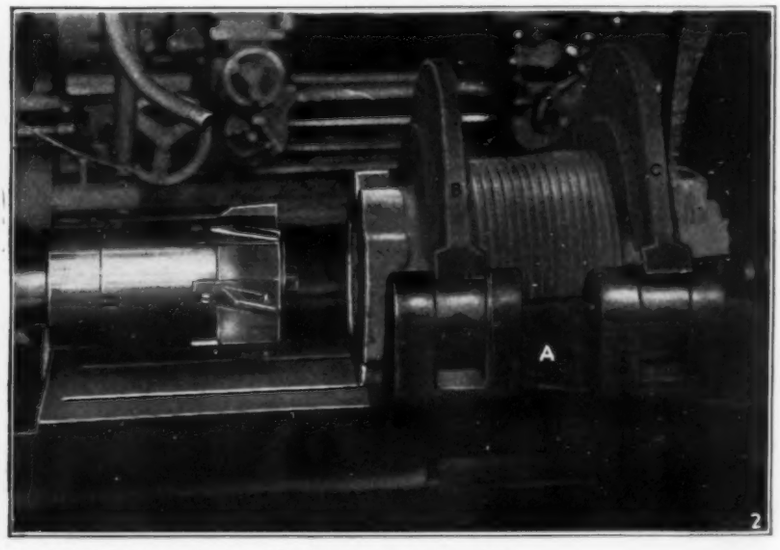


FIG. 1—TURNING FINS FOR CHUCKING. FIG. 2—BORING ON GISHOLT

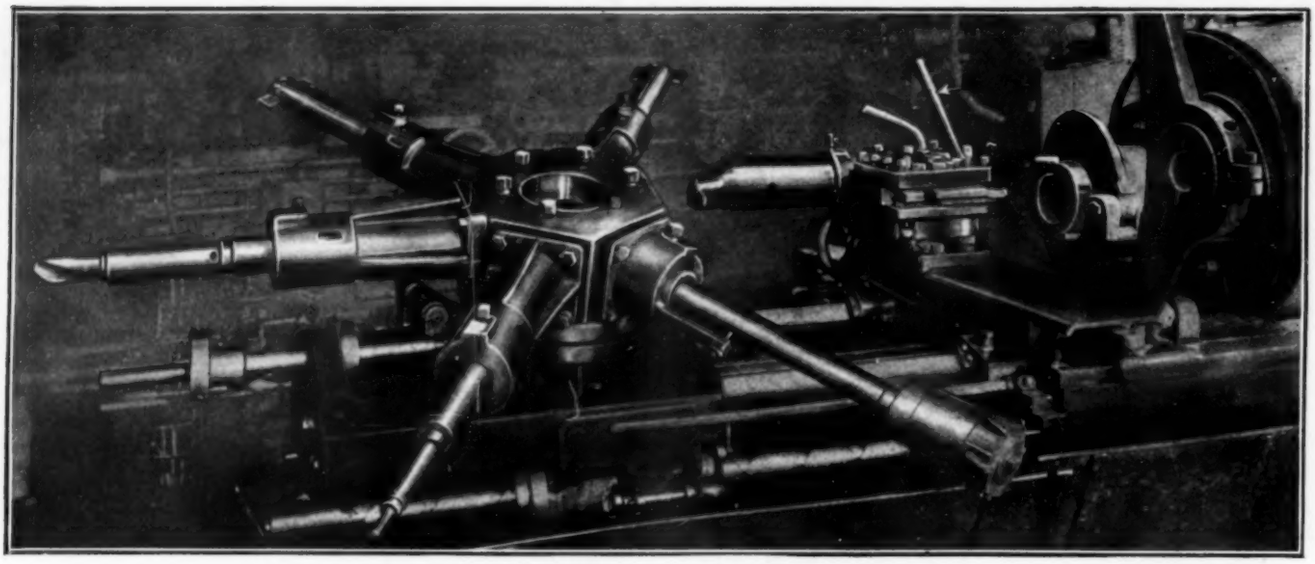


FIG. 3—DETAILS OF THE TOOL LAYOUT

A study of the tool equipment in the main turret gives a very good idea of the boring and reaming, an unusual feature of this cylinder work being the bar *A* which is clamped in the toolblock turret instead of in the main turret. The tool block also shows the facing tool which is in position for work. The bar *A* is for recessing the compression chamber of the cylinder, the bar being run inside and the cutters expanded into position by means of the lever *B*. This is shown more clearly in Fig. 4. Here the recessing bar *A* is shown in position for entering the cylinder. The operator expands the cutters for counter boring by means of the lever *B*. Two cylinders with the fins turned for clamping, but otherwise in the rough, are shown at the left.

Turning the Cooling Fins

The cylinder is next mounted on a suitable mandrel in an engine lathe and the fins turned with a single pointed form-tool which is run down between them. This method has been found more satisfactory than using a multiple pointed tool which occasionally catches and tears some of the fins. In addition to obviating this difficulty the single pointed tool has proved to be about as rapid as the multiple tool in the long run.

There remain several drilling operations, one of which is shown in Fig. 5. This is drilling for the valve stem guides, the cylinder being held at the proper angle which is 8 deg. in this case. Then the spark plug holes, the bolt holes in the lower flange, and other drilling is done, suitable fixtures being provided for each operation.

Having nine radial cylinders, this engine requires only a single-throw crankshaft and what is known as a "master" connecting rod with eight articulated rods connected to it. This construction gives a long-bearing crankpin as shown in Fig. 6 where it is being held for turning in the lathe by means of suitable blocks at each end to give the desired throw. The overhang of the tool is usually supported by a block on the tool slide. The sides of the crankshaft cheeks are finished by straddle milling as shown in Fig. 7, the milled surfaces being used for attaching two bronze balance-weights for neutralizing the reciprocating and revolving forces and

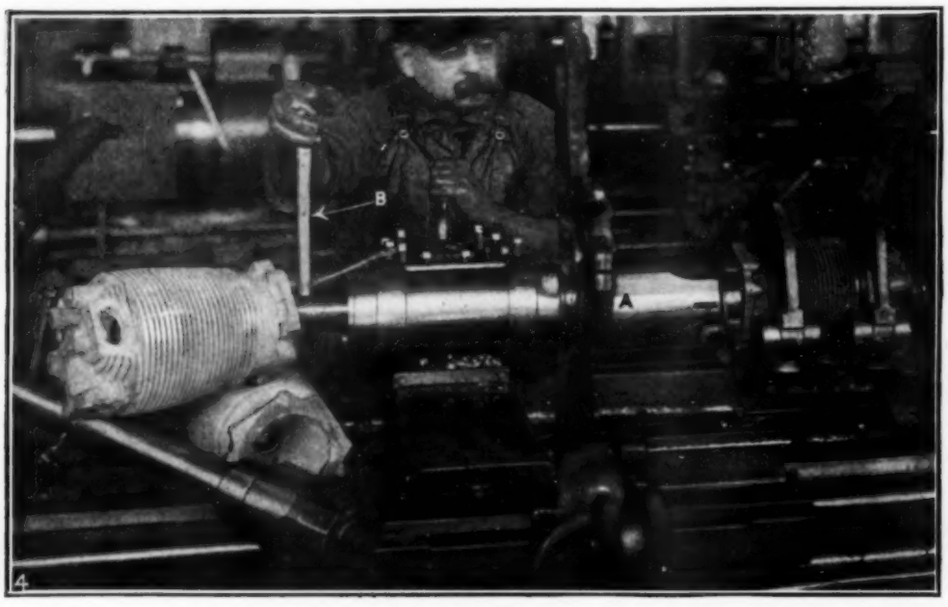
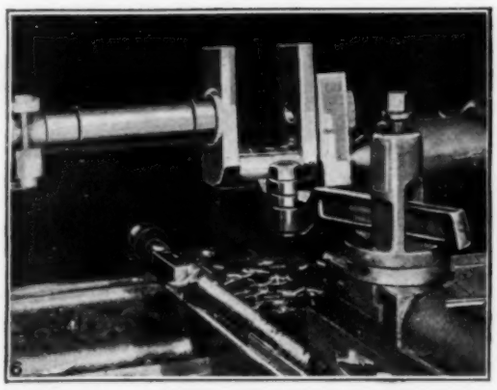


FIG. 4—RECESSING BAR IN TOOL-POST. FIG. 5—DRILLING FOR VALVE-STEM GUIDES



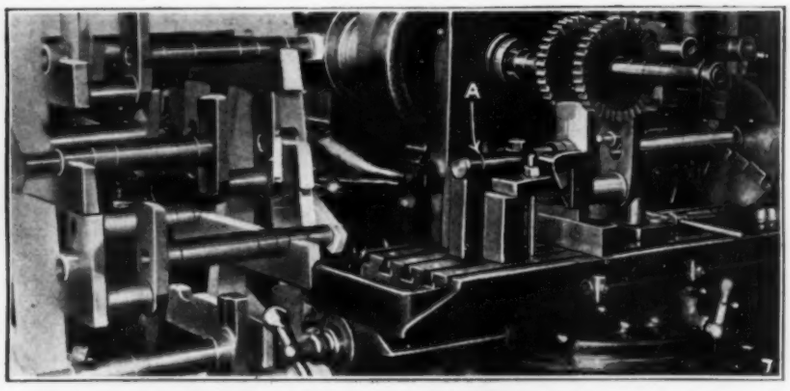


FIG. 6—TURNING CRANKPIN ON SHAFT. FIG. 7—MILLING WEBS FOR COUNTERWEIGHTS

securing a minimum of vibration. The method of holding the crankshaft can be clearly seen, one end being held in a 3-jawed chuck and the other supported by the auxiliary shaft *A*.

Two of the drilling operations on the master rod are shown in Fig. 8, one of them being necessary in order to clamp the cap and the rod together. The joints of the rod and cap have been previously milled in suitable fixtures. Drilling the bolt holes is done in the fixture at the left, the rod being held in position by the hairpin bolt *A*. The rod is clamped firmly to the bushing plate *B* which simply rests on the uprights *C* and *D* to make it easy for the operator to handle the rod under the vertical drilling machine shown.

Drilling Knuckle Pin Holes

Using the bolt holes to locate the rod in the second drilling fixture, it is held in position by the two C-clamps shown. The first operation for drilling all knuckle pin holes and also the small end of the rod is shown in Fig. 11.

The master connecting rod is of I-section, forged from chrome-nickel steel and its large end is provided with flanges on each side which flanges carry the knuckle pins for the eight articulated rods. The large end of the master rod carries a bearing cap as usual in connecting rod practice, this cap having corresponding flanges as can be seen in the illustrations which follow. In Fig. 9 is shown the machining of two such caps at one opera-

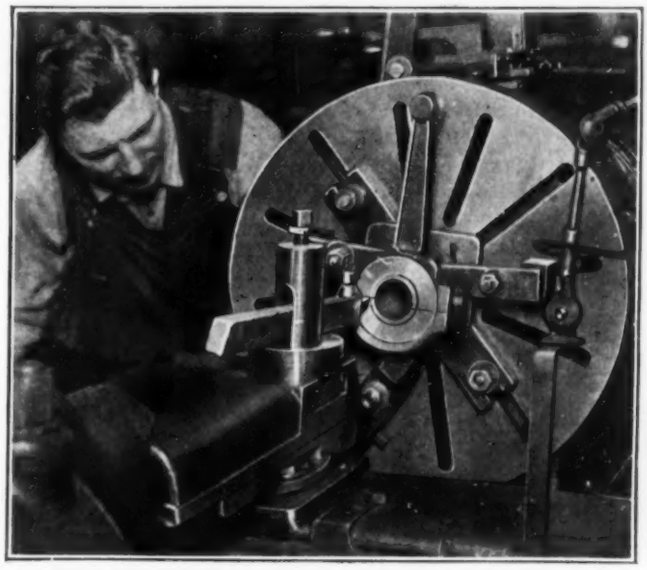
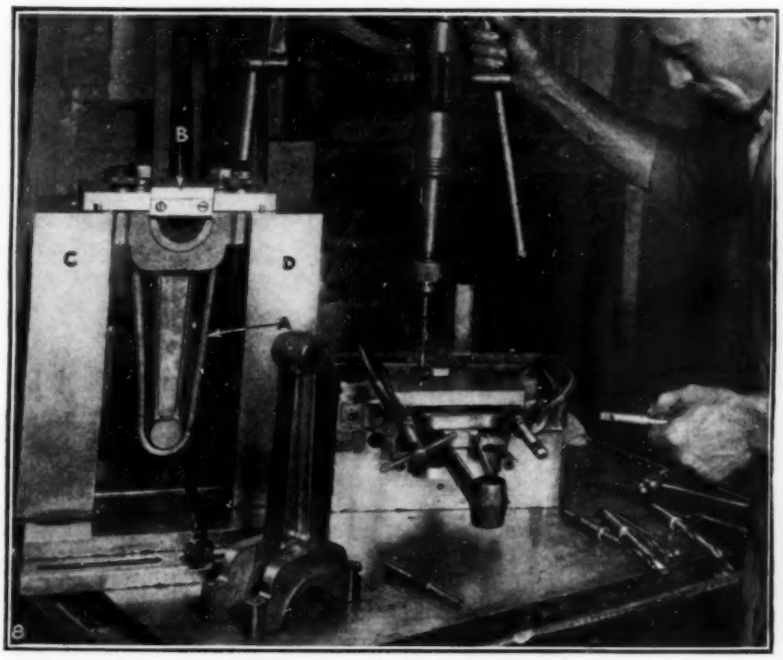


FIG. 10—FACING ROD AND CAP



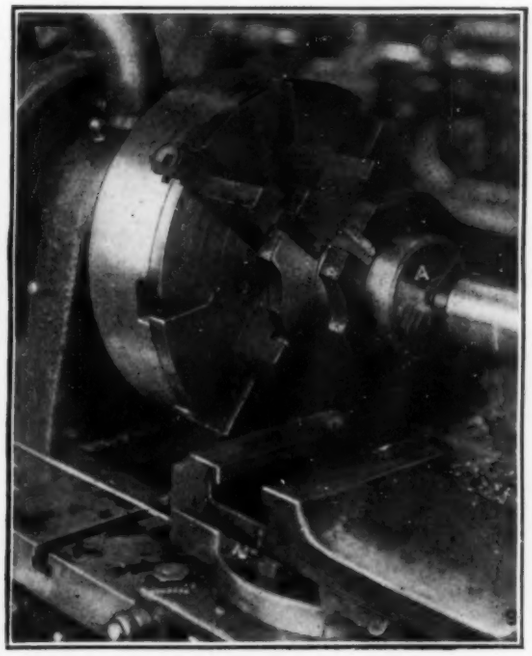


FIG. 8—DRILLING BOLT HOLES IN ROD. FIG. 9—TURNING THE ROD-CAPS

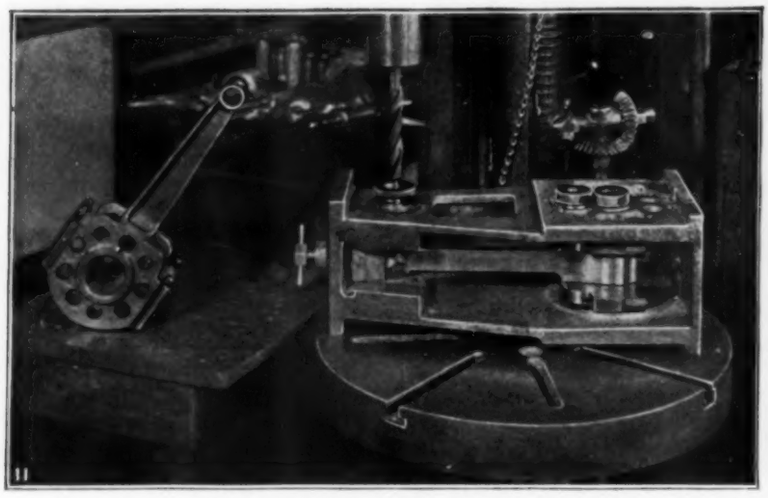


FIG. 11—DRILLING FOR KNUCKLE PINS.

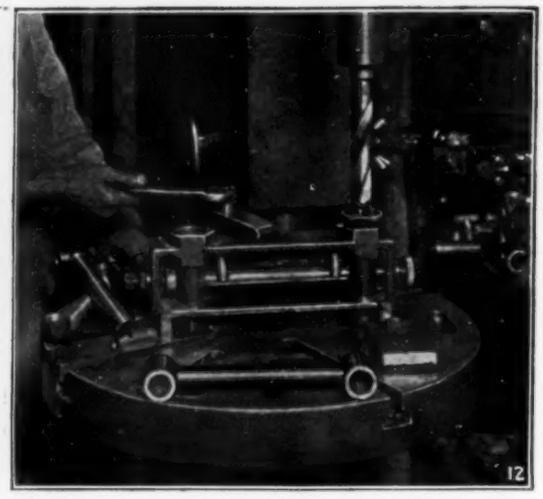


FIG. 12—DRILLING ARTICULATED RODS

tion, both caps being clamped on a mandrel *A*, the bore having been previously machined. The caps are held together by the chuck jaws which also hold them firmly on the mandrel and drive them for the turning operation.

The caps are separated and each assembled to a master rod as shown in Fig. 10. The rod and cap are worked as a unit from this point and are very carefully located on the face plate by means of a suitable surface gage. When properly adjusted the rod is held against the face plate by means of the clamps shown, the outside of the flange faced and the hole finish bored.

Rod and Cap Operations

In Fig. 11 both the rod and cap are drilled together, a single drilling bushing being moved from hole to hole in the fixture. As may be imagined great accuracy is necessary in the making of this fixture, so as to secure the proper alignment of the holes for the knuckle pins.

Another connecting rod operation (this time on an articulated rod) is shown in Fig. 12 where the holes for both the piston pin and the knuckle pin are being drilled at opposite ends of the rod in the same fixture. The view also shows that the articulated or "baby" rods are hollow, the drilled end being shown at *A*.

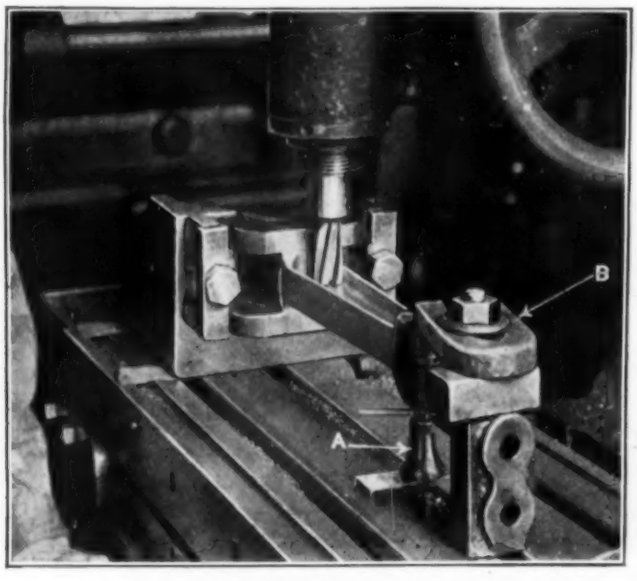


FIG. 13—MILLING THE CHANNEL

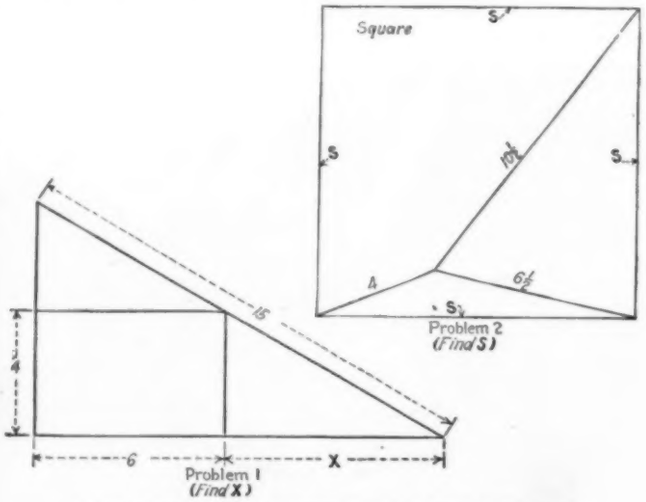
One of the milling operations on the master rod is shown in Fig 13 where the channel is being machined with an end mill on a vertical machine. The large end of the rod is held in the fixture shown, being supported by the flanges. The small end is supported by the jack *A* and held down by the hairpin clamp *B*.

Trigonometry Problems from the Drafting Room

By E. D. Thompson

The two problems that are shown herewith came up in the drafting room, and caused considerable trouble. We were not satisfied with the solutions obtained. The thought came to me that some of the readers of the *American Machinist* who are experts on trigonometry could throw some light on the problems.

[Editor's Note: The problems hardly require explanation. Problem 1 can be solved in several ways which result in fourth-power equations that are rather difficult of solution. Problem 2 appears to offer more difficulties. The simplest and least involved solutions are the most desirable ones, in view of the fact that the results are for actual shop use. Send in your solution so that Mr. Thompson's troubles can be ended.]



TWO PROBLEMS IN TRIGONOMETRY ARISING IN THE SHOP

Internal Grinding and Its Advantages

By FRANK W. CURTIS

Grinding as a means of producing precision parts—Factors that influence internal grinding—Types of internal grinding machines—Selection of grinding wheels

THE FINAL machining of inside circular surfaces of mechanical units where limits of accuracy are close and finish in important, is probably accomplished more satisfactorily by internal grinding than by any other means. It is a method that insures a true, smooth hole and is becoming universally recognized as a means of producing precision parts. The limitations of an internal grinding machine are in no way held to any special type of work, as machines on the market are adapted for work ranging from typewriter parts to turbines of large size.

Grinding is the only method for finishing metal parts after hardening and in this respect has many advantages. Most metal parts will run out of round after being hardened and if their use in a unit is important it would be poor policy to use them without first truing the holes or faces on a grinding machine.

Components made of cast iron, such as cylinders requiring a fine and accurate finish, are generally finished by reaming, rolling or grinding. In order to produce a smooth hole by reaming, it is necessary to use several sizes of reamers and remove only 0.001 in. on the last or final cut.

The rolling method is accomplished by passing a tool containing a number of hardened rolls through the bore after reaming. The diameter of the tool is somewhat larger than the reamed bore and its action is to squeeze or compress the metal. There is a tendency for the metal to relax after the rolls are withdrawn. The bore after this operation is larger than the reamed size. For example, a cylinder reamed to 3.996 in. is rolled with a tool 4.002 in. in dia., and the finished size is 3.998 in. Unless the work being rolled is uniform and properly ribbed, the bore will vary somewhat in size. Grinding of such holes is considered to be superior in most cases, a fact which is recognized especially by manufacturers of cylinders having sliding units such as pistons and piston rings sliding through them.

In determining the factors influencing an internal grinding problem the following points will be of assistance in checking up necessary information.

Design of part
Production required
Fixtures
Type of machine and wheel required
Amount of material to remove
Setting up operation
Speeds and feeds of machine and work
Gaging of surfaces being ground
Obtaining production
Safety guards

The design of the part should be well considered as the type and size of machine and the grade of wheel depend entirely upon the shape and size of the work, the material of which it is made, and the accuracy required in the operation. A hole should not have more surface than required for its particular function. An example of work on which too much surface was ground is shown in Fig. 1 in which the work *A* had been ground as shown at *B* until investigation proved that the method at *C* with the work having a relief *D*, was just as satisfactory. The result was that the wheels lasted longer

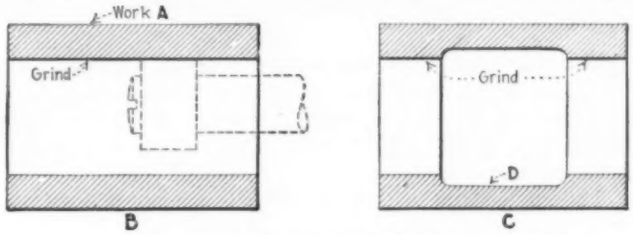


FIG. 1—COMPONENT REDESIGNED TO OMIT UNNECESSARY GRINDING

between dressings, gave longer life, and production was considerably increased.

Several examples of work requiring internal grinding are illustrated in Fig. 2. Each part shown is ground on

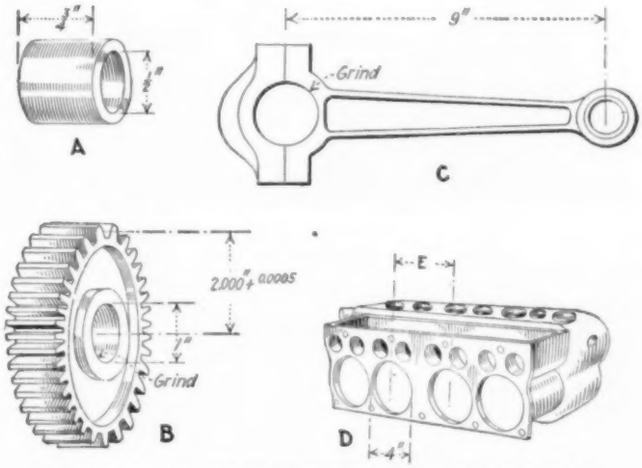


FIG. 2—VARIOUS CLASSES OF WORK REQUIRING INTERNAL GRINDING

a different type of machine. At *A* is shown a small hardened steel bushing which is held in a collet on a small machine. Work of this kind is produced very rapidly as only a small amount of material is removed and no special fixture or chuck is required for holding. The part shown was finished to 0.001 in. in 30 sec., with 0.004 in. of material removed.

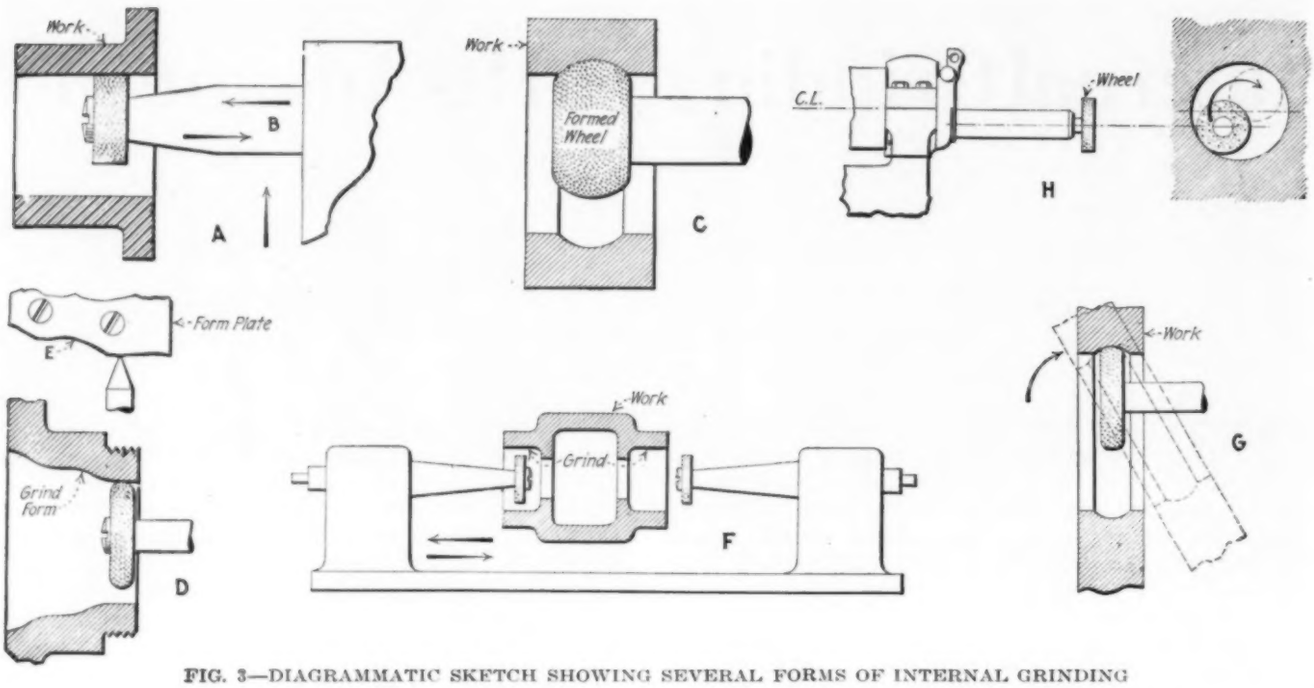


FIG. 3—DIAGRAMMATIC SKETCH SHOWING SEVERAL FORMS OF INTERNAL GRINDING

The spur gear *B* is best produced on an automatic internal grinding machine. A special fixture is required in order to locate the work from the pitch diameter. Three pins are generally used and clamps are applied to hold the work in place.

The connecting rod shown at *C* is produced on a machine having a large swing. The fixture, if only one piece is done at a time, must be properly balanced, which in fact is a point very essential in all grinding operations where the work revolves. Fixtures for this class of work are light in construction and very little pressure is required to hold the work because the amount of stock removed is always held to a minimum.

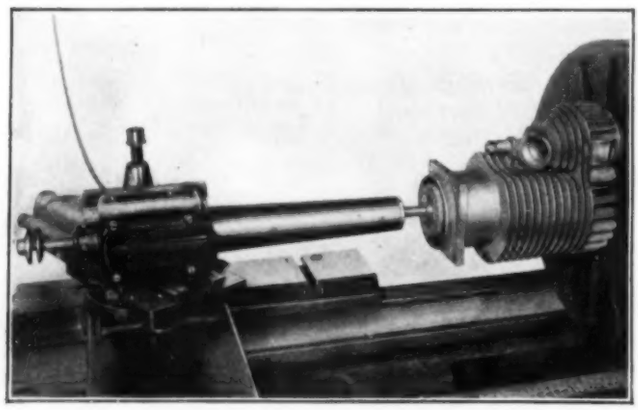


FIG. 4—INTERNAL GRINDING OPERATION ON AN ENGINE LATHE

The cylinder shown at *D* could not be revolved very well and for this reason is ground on a cylinder grinding machine. The work is clamped in a fixture on a cross table which is indexed according to the center distances of the holes *E* so that all of the internal grinding is done in one setting. The wheel is the only moving part and its action is explained in the discussion of the next illustration.

In order to show some of the various types of machines used for internal grinding Fig. 3 is given in diagrammatic form. Before going into the details of these types, let us refer to Fig. 4, which shows an internal grinding operation on an engine lathe. While the grinding apparatus may be considered as an attachment, there are many advantages connected with its use. When only a few parts are produced, a set up of this kind is very economical. The accuracy depends upon the accuracy of the machine tool to which it is applied. The illustration shows a Dumore grinder set up on a standard engine lathe for regrinding motorcycle cylinders. The grinder is fastened in the tool post and is fed into the work by mechanical feed. The work is seen clamped to a face plate, a center locating plug centralizing the cylinder and a bolt through the valve hole acting as a driver as well as a means of clamping. While this is not strictly a production operation, the grinding time averages 12

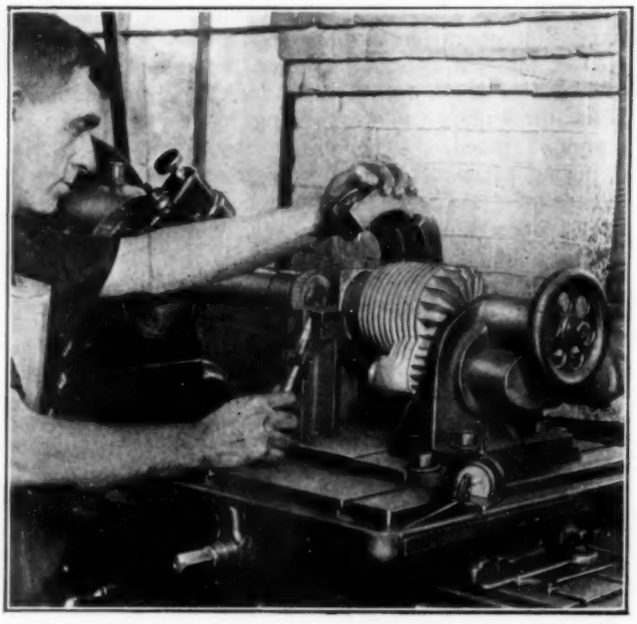


FIG. 5—AN INTERNAL GRINDING OPERATION ON THE INDIAN MOTORCYCLE CYLINDER

FIG. 6—CYLINDER GRINDING ON CHUCKING GRINDING MACHINE

to 14 min. per cylinder. Due to the hardness of the material, resulting from wear it receives in operation, a 46K silicate wheel, Waltham made, is used. The wheel is 2½ in. in diameter with a ⅝ in. face and is run at 5,500 ft. per min. This is a very interesting internal grinding operation and is given as an example to show the use of this type of grinder. The same cylinder is illustrated later in this article as ground on a production basis.

Referring to *A*, Fig. 3, an example of plain grinding is shown. The wheel is mounted on a spindle *B*, which is held on a cross slide. Movement in and out may be either by hand or automatic. At *C* is shown a form grinding operation. In this method the wheel is located in the bore of the part to be ground and is then moved into the work. The wheel is dressed to a form to correspond with the contour of the hole. This method is not commonly used as the wheel will not hold its shape a great length of time. *D* shows the method used for generating an irregular contour. The path of the wheel is controlled by the form block *E*.

At *F* is shown a duplex or two-spindle machine suitable for grinding both ends of a component in one setting. The heads are fastened on a slide which oscillates back and forth, so that only one wheel is engaged at a time. A generating type of machine in which the wheel is stationary and the work is swung around is shown at *G*. In operating this type of machine the spindle is moved into the work so that the wheel is in correct relation with the radius required, and as the work revolves, it is swung as indicated by the arrow.

In Fig. 2 at *D* was shown a cylinder block as ground on a machine designed for the purpose. The principle of this type of machine is shown at *H* in Fig. 3. The wheel revolves in a spindle which in turn revolves around the center of the work at an adjusted radius. Adjustment for size is obtained by means of a hand wheel located on the grinding head. The machine is adapted to large work and components which cannot very well

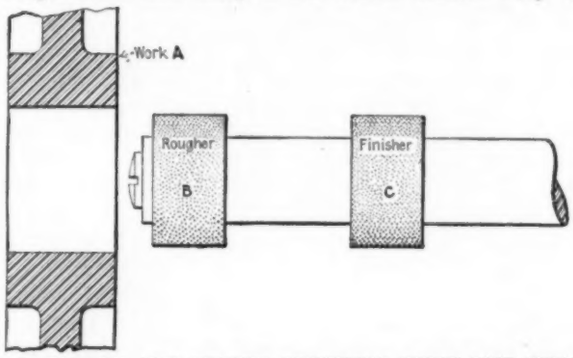


FIG. 8—ROUGH AND FINISH GRINDING WITH ONE SET-UP

be balanced on revolving fixtures or work-holding chucks.

As the internal grinding machine is a precision machine tool from which very fine work is expected, great care should be taken to see that all bearings and running parts are properly oiled. The spindles are adjusted in the bearings with little clearance, on account of the high speed at which they run, and poor oil or oil too thick will cause them to stick. Special spindle oils are available.

Whenever possible an exhaust line should be provided in the set-up so that the dust will not be left to lodge around the bearings of the machine and to circulate around the room, causing damage to surrounding machine tools.

One of the most important factors connected with internal grinding is the wheel. Unless a wheel is of correct grade and run at a proper speed, the result will not be satisfactory. Proper dressing of a wheel is essential as the condition of the wheel governs the quality of the work. No work can be truer than the wheel that produces it. A wheel which will glaze is generally too hard and softer grades should be tried. A good rule is to use as soft a wheel as possible, that is, one that will stand up under normal cuts, as the soft wheel cuts more freely and more rapidly than the hard

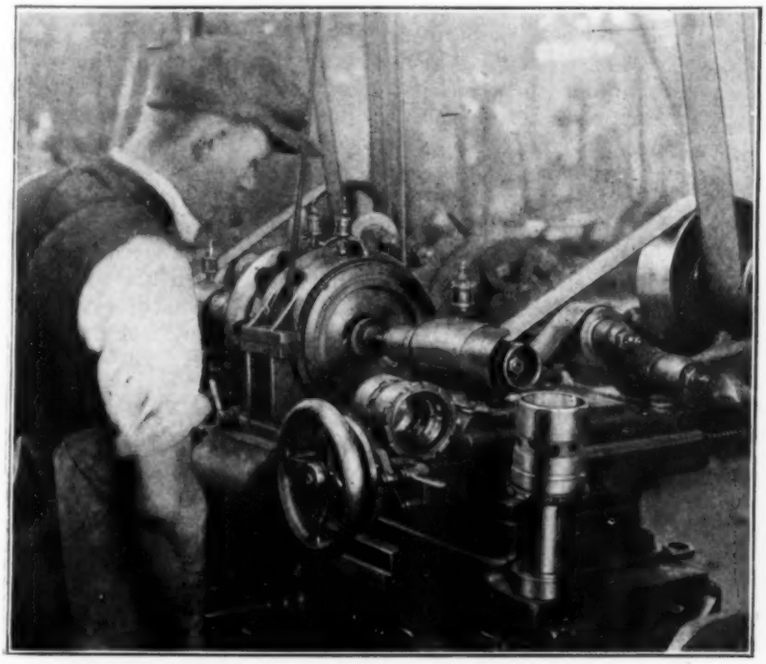


FIG. 7—INTERNAL GRINDING ON THE DUPLEX MACHINE

wheel. A wheel of fine grain does not always insure a fine finish. The condition of the face of the wheel, true running, and the speed and feed used will govern the finish more than will the coarseness or fineness of the grit of which the wheel is composed.

Next to the grade, perhaps the speeds and feeds of wheels are factors requiring the most consideration. Although the wheel is correct in grade, it may be useless without the proper speed. A wheel running at too low a speed may be compared to a soft lathe tool in that it wears off rapidly. Proper feeds and speeds will generally insure long life, as very little will be worn off the wheel. A properly selected wheel, running at correct speed and feed, should not wear more than 0.0005 in. per hole, in grinding an automobile cylinder with a bore of 4 in. A recent test on a medium-grade cylinder showed that 325 holes wore the wheel down ½ in. (from 3 in. to 2½ in. in diam. This shows approximately 0.0015 in. per hole and includes the material taken off the wheel at dressings. The amount of metal removed was 0.012 in. on the diam. This remarkable performance can be credited to correct speed and feed, and knowledge of how to dress the wheel, although such results cannot always be obtained.

A grinding operation on the Indian motorcycle cylinder is shown in Fig. 5. The machine used is a Heald No. 55. The material is cast iron having a scleroscope hardness of 40 to 42. The fixture holds the cylinder stationary by means of a swinging clamp which grips the work below the flange on an accurately finished diameter. A plug attached to the large handwheel shown at the right, locates the top of the cylinder. Pressure applied to the locating plug forces the flange of the cylinder to an end stop against the swinging clamp and also against the stationary portion. The bore is 3.125 in., having only 0.0005 in. tolerance; the length of the ground portion is 7 in.; 0.011 in. is removed; and the operation is completed in 9 min. A 3-in. special cup wheel, No. 40-S carborundum, is used, running at 5,500 r.p.m., or a speed of 4,300 ft. per min. The eccentric runs at 82 r.p.m. and the feed is 0.062 in. per revolution of the eccentric. Approximately 25 pieces are ground to each dressing of the wheel and the life of the wheel is 5 dressings, or 125 pieces. The gaging is accomplished by means of an Ames dial indicator mounted in a special frame having two sleds, or locating blocks, hardened and ground. The handle attached is flexible, so that the gage takes its own course and is not likely to be cocked or forced in crooked. This gage embodies a three-point principle that insures accurate readings. The operation is very efficient and the data shown are the result of many tests made to determine the correct wheel, feed and speed.

Grinding Aeroplane Motor Cylinder Sleeve

Another method of grinding a cylinder is shown in Fig. 6, where the Bryant chucking grinding machine is in use. In this operation the part revolves in a specially designed fixture which locates the work on two previously finished ground diameters. Two small clamps are used to hold the cylinder in place. The bore is 4.25 in. in diam., and 9 in. long, and 0.015 in. to 0.018 in. of metal is removed. The limits of bore are ±0.001 in. and the production is 5 pieces per hour. One of the advantages of this type of machine is that the grinding head drops out of the way when the wheel is withdrawn from the work, a feature that facilitates gaging and loading.

Mention has been made of the duplex internal grinding machine and in Fig. 7 is shown a set-up on a machine of this type manufactured by the Heald Machine Co. The component shown on the right hand end of the machine is ground internally on both ends at one setting, insuring concentricity. The fixture located on the table of the machine as shown has a revolving portion which holds the work, being driven by a separate belt. The spindles oscillate back and forth, only one in operation at a time. The wheels run at 5,000 ft. per minute.

When holes of small depth require both rough and finish grinding, it is of advantage to do these operations in one setting if possible. Fig. 8 shows two wheels set up on a special spindle for grinding the work *A*. Wheel *B* is the rougher and removes all but 0.002 in., while wheel *C* is the finisher and completes the hole. The design of the component is often of such shape that two settings would require as high as 0.005 in. to be removed by the finishing wheel in order to insure that the hole clean up, and for that reason a set up as shown will give better results and will prolong the life of the finishing wheel.

Requirements of a Good Draftsman

By H. R. Johnson

On page 468, Vol. 58, of the *American Machinist*, I read the article entitled "Simplicity in Machine Design" by Entropy. He states that it is a simple thing to learn to be a draftsman. All that is necessary to know is a little about projections, something of conventionalities and acquire some dexterity of hand.

In addition to this I would say a draftsman has to be a fairly good mathematician, must be able to figure stresses and strains, must understand all classes of gearing, mechanical motions and mechanics in general. He has to know enough about the pattern shop and foundry so the parts he designs will not require a half dozen core boxes to cast the part. He has to know something about what can be done and what can *not* be done in the machine shop in regard to machining castings and stock. He must be fairly accurate and fast at the same time, as a slow man will not be tolerated in a lot of places.

The writer has worked as a draftsman for the past ten years in a dozen places, large and small in different parts of the country and can easily state that if he measured up to Entropy's standard of the draftsman, he would not have lasted two days on any job he ever had.

In my estimation a draftsman is not a necessary evil and a man in a rut who will never get any farther as some of the wise ones would tell us. On the contrary he is just as important a cog in the machinery of a manufacturing concern as the toolmaker, machinist or pattern maker.

A good draftsman is paid just as much and more than the best of mechanics, and works a shorter length of time for it. The draftsman's chances of advancement are better than the shop man's because he generally has a better education. It cannot be denied that a great number of the present-day chief engineers, general managers and superintendents, at one time, worked as draftsmen. These statements are facts based upon actual experience and not from someone's idea of the situation, and they prove that a draftsman must know something more than Entropy claims is necessary.

The Austrian Workman

By James A. G. Pennington

The conditions under which the present day Austrian workman performs his work are largely governed by federal laws. His safety is a matter of federal legislation. In fact such questions as life insurance, sick benefit, pensions and working hours are all fixed by law. The question of wages is settled between the employers and the labor unions, who are very strong in Austria. Where the workman lives in a factory owned house, the federal law makes certain provisions but otherwise leaves matters to local authorities.

Just at present the Austrian workman is living in the silk shirt era as it was called in America. He does not, however, buy silk shirts and automobiles as they are in most cases more expensive than in America, but he throws his money away on other luxuries. Formerly the workman was satisfied if he could have a place to live, buy three meals a day and put something aside for a rainy day. Now that is a thing of the past. He drinks wine instead of beer, buys fine clothes, spends a lot of money at the candy shop and confectioners, has better meals than formerly; but he saves nothing, which is easy to understand.

Saving money in Austria today is out of the question for the average person. If one deposits a certain sum of money in the bank today it may be worth only half as much in thirty days, because of the steady depreciation of the Austrian currency. For instance in June, 1922, it took 10,000 crowns to equal one dollar, but by the middle of July the dollar had a value of 35,000 crowns. In other words a given sum of money deposited early in June was worth less than one third in a little over a month. The only way for people to put aside money and not have it become worthless is to buy stocks and bonds, although even this method of saving is far from safe. Most people, including the workman, either throw away their surplus funds or buy useful articles before the currency value goes down and the price of the goods goes up.

Fluctuating Values of Wages and Money

The amount of wages for the workmen is variable. As the crown falls in value the wages go up, although they do not keep step with each other. The wages are always two weeks or a month behind notwithstanding the fact that each factory has clerks doing nothing else but correcting the scale of pay. On July 18th the scale of wages for metal and rubber workers averaged 400,000 crowns a month. Since then they have about doubled, but it must be remembered that in September the dollar was worth 75,000 crowns. These are the highest paid workmen and of course the sum sounds enormous, but expressed in dollars it was only about twelve dollars a month. The Unions fix the rate of pay and do not allow a good workman to be paid a higher hourly rate than a poor one, so the factory management endeavors to give the good workman the best paid work. In this way the objections to a fixed rate of pay are largely overcome.

In connection with the labor unions it is interesting to note that they are both labor and political organizations. The workmen are all socialists and formerly controlled the government absolutely, but in the summer elections a more conservative and capable government was elected by the Christian-Socialist party.

Communism among the workmen seems to be a thing of the past. Vienna with a population of two million and the largest factory district, formerly had quite a few communists among the workers, but they have all been thrown out by the men themselves. This is true of most industrial centers of Austria, although in the Wiener-Neustadt district there is still a great deal of radicalism. However, the Austrian workman in general is a good natured, intelligent individual, who is not given to radicalism, although he calls himself a socialist and without exception belongs to a labor union.

Safety Regulations Not Always Observed

Safety regulations and appliances are required by law that are very strict but, as in America, the workmen themselves often do not observe them. Such things as guards over exposed gears or chains are to be found on all machine tools. Large driving belts, such as are used to operate tin plate rolling mills are enclosed and in every possible way the safety of the workman is provided for. Where necessary the men are provided with goggles and helmets, but as a rule it is hard to make them wear such articles. When, however, a workman is injured in a factory the case does not go to court, because the insurance takes care of accident and definite amounts are allowed for various injuries. This avoids litigation which is often expensive for the factory, workman or both and everyone knows what to expect if a given accident occurs. The question of *how* the accident has happened has nothing to do with the amount paid, provided the manufacturer has lived up to the law regarding safety appliances.

The workman must take out both sick benefit and life insurance. His employer pays one-third and he two-thirds of the premium which is deducted from his pay. Any taxes such as income are also deducted and paid to the state by the employer. If a workman becomes incapacitated for work through age or for any other reason he receives a pension from the state, but it is so small at present that he would starve to death without any other source of income. During his period of employment each workman receives free medical attention and if necessary all his hospital expenses are paid by his employer.

Welfare work, as developed in the United States, is not popular with employer or employee. A workmen's council handles all matters which may arise between the factory management and the men, whether they involve individuals or groups of employees. Should a given workman have a grievance of any sort he must lay it before his council. The council decides whether the grievance is justified and if so lays the matter before the factory management. Questions of a collective nature are handled in the same manner. This method of handling disputes has been found satisfactory to both sides.

No Profit in Lunch Rooms

To provide suitable mid-day meals, the factories operate lunchrooms and cafés which, needless to say, are operated at a loss. The patronage given these places by both the workmen and the clerical staffs is very large because it is the most inexpensive way to secure a satisfactory meal. The management does not furnish entertainments during the noon hour, but in many instances places an auditorium at the disposal of the workmen. The men themselves furnish and pay for the amusements, which range from music rendered by their own

band to that of famous opera singers and include other forms of entertainment. The present day audiences at the opera in Vienna could learn a great deal regarding silence and general good behavior from the workmen. Children's playgrounds, day-nurseries, visiting nurses, etc., are all provided, not by the factory management, but by the workmen themselves and this form of welfare work has proved most satisfactory. The workmen don't feel that the management is always butting in on their affairs and yet the same benefits are obtained without a certain paternalism on the part of the employer.

Work Day of Universal Length

The 8-hour day is universal in Austria and even extends to the stores and shops. In the steel industry the 8-hour day is used and has been found perfectly satisfactory. The efficiency of the workmen is much higher than just after the war, but has not reached the prewar standard except in piece work. The Taylor and other similar systems have aroused a great deal of interest and factory managers have given them much thought. However, very little along this line has been put into operation, because it is next to impossible to push the workman.

The unemployed or jobless in Austria are quite a problem just as they are in other continental countries, because they are subsidized by the government and this subsidy with a little work on the side is sufficient to keep these loafers from starving. In fact the unemployed as a rule do not want any regular work.

Labor turnover is very low and it is nothing unusual for an Austrian factory to have the majority of its workers on the payroll for five, ten, or fifteen years. This more than anything else shows that the Austrian workman is satisfied with the treatment he receives.

In conclusion it might be mentioned that most plants are operating from 75 to 100 per cent of their capacity and that the workmen are giving little or no trouble. Should, however, the value of the Austrian currency suddenly increase, the factories will not be able to export their products and widespread unemployment will ensue. What result such a condition would bring about no one is willing to state, but all believe it would cause a revolution.

Manufacture of Professional and Scientific Instruments, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the manufacture of professional and scientific instruments amounted to $42,127,000 in 1921 as compared with $58,137,000 in 1919 and $17,495,000 in 1914, a decrease of 28 per cent from 1919 to 1921, but an increase of 141 per cent for the seven-year period 1914 to 1921. In addition, professional and scientific instruments were also manufactured as a subsidiary product by establishments engaged in other industries to the value of $3,685,000 in 1921, $5,328,000 in 1919, and $1,942,000 in 1914.

This industry includes establishments engaged in manufacturing as their products of chief value medical, surgical, dental, and optical instruments, thermometers, hydrometers, speedometers, nautical instruments, surveying, drawing, recording, and other scientific instruments.

Of the 266 establishments reporting products valued at $5,000 and over in 1921, 221, or 83 per cent, were located in 6 states as follows: New York, 85; Pennsylvania, 42; Illinois, 39; Massachusetts, 24; New Jersey, 17; and Ohio, 14.

In May, the month of maximum employment, 10,337 wage earners were reported, and in November, the month of minimum employment, 8,726—the minimum representing 84 per cent of the maximum. The average number employed during 1921 was 9,384 as compared with 15,931 in 1919 and 7,107 in 1914.

Manufacture of Screw Machine Products, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the manufacture of machine screws and other screw machine products amounted to $18,365,000 in 1921, as compared with $40,015,000 in 1919 and $7,248,000 in 1914, a decrease of 54 per cent from 1919 to 1921, but an increase of 153 per cent for the seven-year period 1914 to 1921. In addition, machine screws were also manufactured as subsidiary products by establishments engaged in other industries to the value of $3,534,000 in 1921, $6,630,000 in 1919, and $816,000 in 1914.

This industry includes establishments manufacturing screw machine products for sale but does not include products of this kind made and consumed by manufacturers of automobiles, machinery, engines, etc. The industry also does not include the manufacture of wood screws.

Of the 160 establishments reporting products valued at $5,000 and over in 1921, 29 were located in Illinois; 25 in Ohio; 24 each in Massachusetts and Michigan; 15 in Connecticut; 14 in Pennsylvania; 9 in New York; 6 in Wisconsin; 4 in Indiana; 2 each in California, Missouri, New Jersey, and Rhode Island; and 1 each in Florida and Maryland.

In January, the month of maximum employment, 7,414 wage earners were reported, and in December, the month of minimum employment, 4,992—the minimum representing 67 per cent of the maximum. The average number employed during 1921 was 5,911 as compared with 10,262 in 1919 and 3,643 in 1914.

The figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports.

The statistics for 1921, 1919, and 1914 are summarized in the following statement:

	1921[1]	1919[1]	1914[1]
Number of establishments	160	136	58
Persons engaged	6,983	11,621	4,093
Proprietors and firm members	105	71	28
Salaried employees	967	1,288	422
Wage earners (average number)	5,911	10,262	3,643
Salaries and wages	$9,240,000	$15,023,000	$2,894,000
Salaries	2,692,000	2,918,000	584,000
Wages	6,548,000	12,105,000	2,310,000
Contract work	188,000	73,000	1,000
Cost of materials	7,577,000	14,984,000	3,058,000
Value of products	18,365,000	40,015,000	7,248,000
Value added by manufacture[2]	10,788,000	25,031,000	4,190,000

[1] Statistics for establishments with products valued at less than $5,000 are not included in the figures for 1921. There were 12 establishments of this class, reporting 9 wage earners and products valued at $34,000. For 1919, however, data for 7 establishments of this class, reporting 7 wage earners and products valued at $18,000, and for 1914, data for 6 such establishments, with 18 wage earners and products to the value of $26,000, are included in all items with the exception of "number of establishments."

[2] Value of products less cost of materials.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

XVI. Simple tools that save time—Utilizing scrap parts for fixtures—A towing apparatus without a dolly-bar

TO ONE WHO has the opportunity of inspecting the equipment in a number of service stations, the fact soon becomes apparent that the well-equipped shop is the one that gets the business. A foreman with more than an average amount of imagination may make many thousands of dollars for his firm in the course of a year. And the owner or manager who does not hesitate to sacrifice a small amount of time or money in order that his men may have tools to work with, will find that the returns on his investment consist of a spirit of co-operation and good-will that is invaluable.

The equipment of the Nulsen-Thomson Auto Co., St. Louis, Mo., includes a number of tools that expedite the work and aid materially in reducing costs. One of these tools is the device attached to the cylinder block in Fig. 1, and consists of three burners connected by a hose to an acetylene gas tank. This device makes it possible to pre-heat the bearings on the block for re-babbitting and pour the babbitt without moving the cylinder.

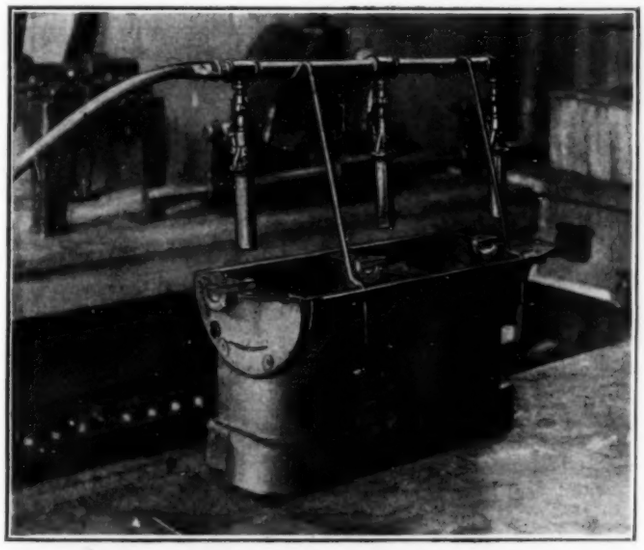


FIG. 1—PRE-HEATING MAIN BEARINGS FOR RE-BABBITTING

When the bearings are hot enough and the babbitt is properly melted, the device shown in Fig. 2 is applied to the cylinder block and the pouring proceeds. This device is set onto the bearing, which can easily be done when the handle is parallel with the axis of the bearings. Swinging the handle at right angles to the bearings, as shown, closes the ends of the bearing and locks a dummy shaft in place so that the metal can flow around it. As soon as the metal sets, the device is moved to the next bearing and the operation repeated. This device is marketed by the Hempy-Cooper Co., Kansas City, Mo.

FIG. 2—POURING THE BABBITT

The lapping tool shown in Fig. 3 consists of two oil stones, each hinged at the middle to a flat spring, the whole being attached to a small shaft that can

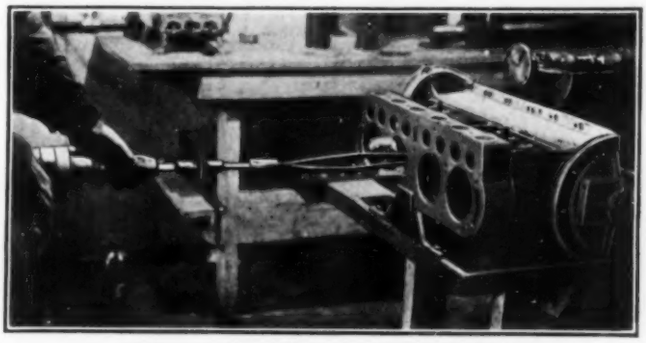


FIG. 3—LAPPING A CYLINDER BORE

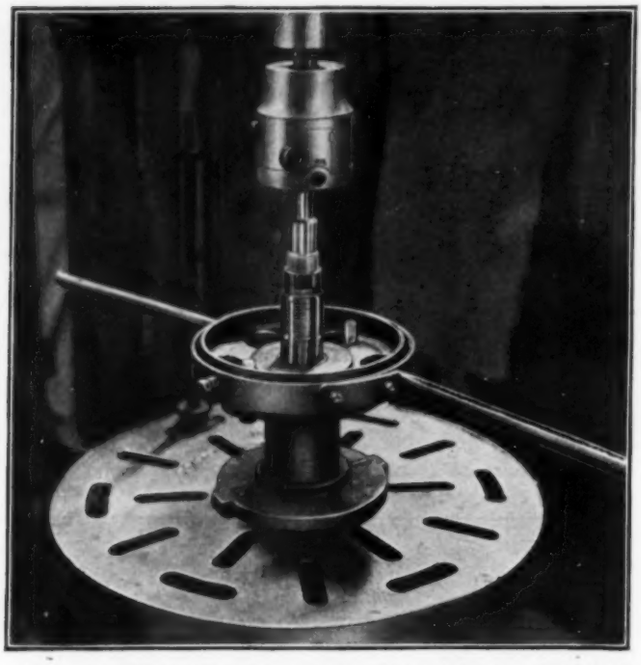


FIG. 4—FIXTURE TO HOLD TRANSMISSION FOR REAMING

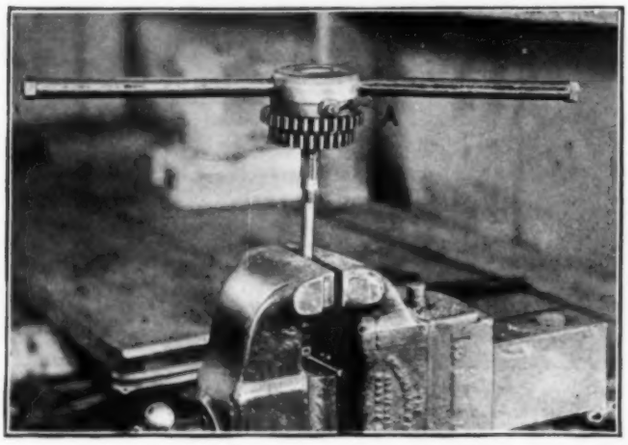


FIG. 5—TOOL FOR REAMING A FORD TRIPLE GEAR

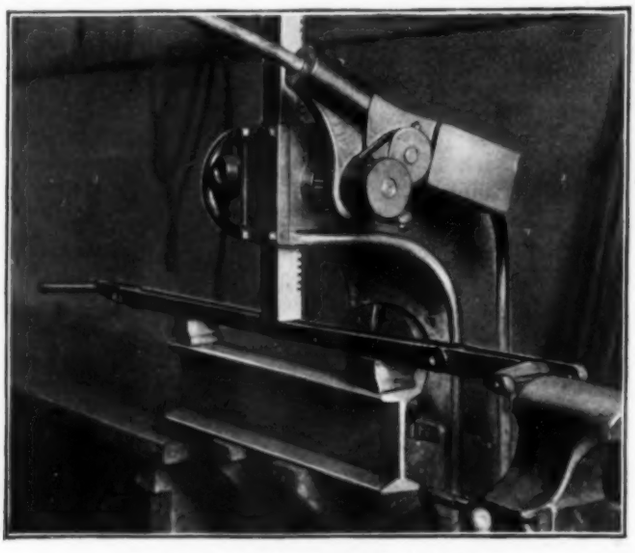


FIG. 6—STRAIGHTENING AN AXLE

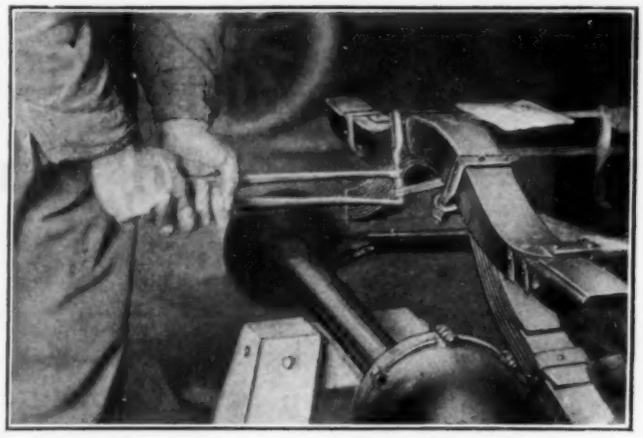


FIG. 7—ASSEMBLING THE SPRING CLIP BAR TO A SPRING CLIP

be inserted into the chuck of an air drill. The tension of the springs serves to hold the stones tightly against the cylinder wall and the tool is worked back and forth in the cylinder while revolving. Kerosene oil is used to facilitate the operation. This tool is usually used after the cylinder bore has been re-ground, and produces an excellent finish. This is also a commercial tool, being sold by the Universal Tool Co., Garwood, N. Y.

The tool shown in Fig. 4 is used to hold a transmission brake drum while the bronze bushing is being reamed, so that the reamer can center itself and remove an equal amount of stock from all parts of the bushing wall. The tool is made of an old rear-wheel brake drum and two 2½-in. floor flanges held together by a 3-in.

FIG. 8—STRAIGHTENING A FENDER

nipple. The handles were made from a length of round steel. Two cap screws were set into the old brake drum so that the drum to be reamed can be held easily. The manner of holding can be seen in the illustration.

A handy apparatus for reaming a Ford triple gear is shown in Fig. 5. This consists of an old Ford fan pulley through which is inserted an old steering cross-rod, held by a nut at each end. Holes are drilled in both sides and two capscrews are inserted in the holes from the inside and held by nuts as shown at *A*. The

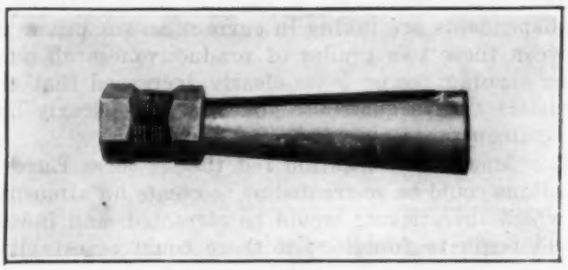


FIG. 9—TOOL FOR REMOVING A WHEEL

head of each capscrew has been ground to a V-shape so that when the fan pulley is dropped over the end gear, the heads will slip between the gear teeth. Then when the tool is revolved, the gear is forced to revolve with it.

A section of I-beam is a handy thing to have around the shop, as can be seen by reference to Fig. 6. In this instance it is used to give the necessary length to the press table.

The task of getting a spring-clip bar over the two legs of the spring clip without the proper tools is what is sometimes known as a mean job, especially if the clip is located under the rear of a sedan body. The operator shown in Fig. 7 has bent the end of one plier handle to 90 degrees and forked the other one. Thus the forked end can be placed against the spring clip leg, the bent end inserted in the hole in the bar, as shown, and the bar can be sprung on without any difficulty.

No handier tool for straightening a bent fender or running board can be found than that shown in Fig. 8. This tool consists of a bar on which is a hook that can be slipped along to any position desired and will work equally well on either a large or a small bend.

The tool shown in Fig. 9 is made of the end of a Ford axle, onto which is screwed an axle-shaft nut. By screwing this device onto the end of an axle and striking the end with a hammer, a wheel can practically always be jarred loose easily and quickly. This operation can be seen in Fig. 10.

A device for use in towing cars is shown in Fig. 11. It is made of two lengths of angle iron, joined together by a plate at one end and has two hooks bolted to it at the other end. The plate has a hole in it so that it can be anchored to the wrecking car as shown in Fig. 12. The car that is to be towed is hoisted high enough so the hooks can be placed over the hand lever control-shaft, then the car is lowered until the front axle rests on the bars. The use of this apparatus obviates the use of a dolly-bar, and, it is said, is much handier.

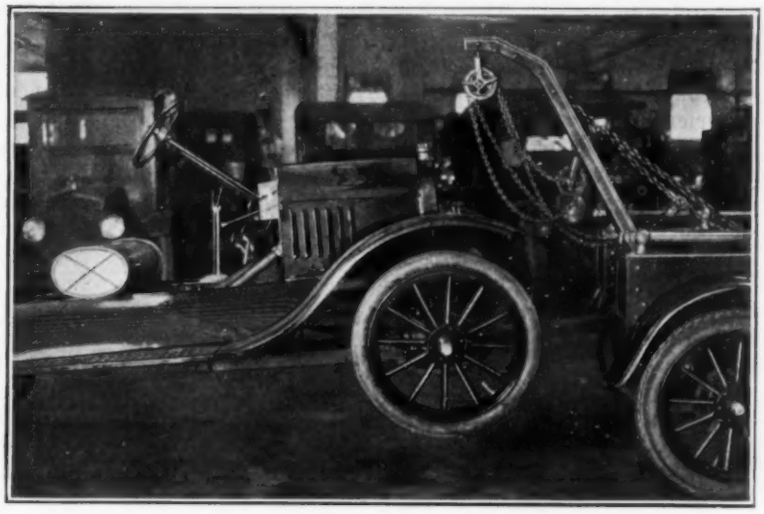


FIG. 12—HOW THE APPARATUS IS USED

FIG. 10—JARRING THE WHEEL LOOSE

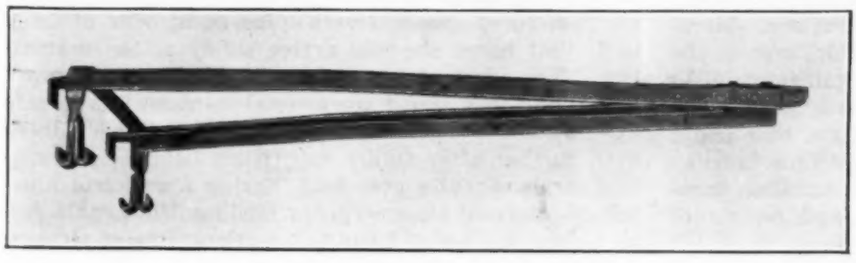


FIG. 11—APPARATUS FOR TOWING

Of Which Class Are You?

By Kenyon Riddle
City Manager, Middletown, Ohio

The two classes arrayed against each other in government are often the selfish and the unselfish. Among the selfish are those who have special interests to subserve, the bitter and prejudiced whose hearts are filled with hatred, the corrupt who want to make something out of the government, and those who would destroy so that they can pick up the pieces. Allied with the forces of unselfishness are the public spirited people who love their country and their city and who desire justice and honesty in government.

Every city has a soul, the nature of which depends upon the collective character of all the souls of such individuals as constitute the majority in elections and other means provided for the people to assert themselves in government. The soul is good or bad as a result of the preponderant forces in government.

Excerpts from a speech delivered at the National Conference of Business Paper Editors at Middletown, Ohio.

Greater Use of Machinery Recommended to Europe

By Julius H. Barnes

THE American delegation, in going to Rome, in considering the main subjects for discussion on the program—allied debts and reparations—with the business men of the world, came to the conclusion that if it was to make any lasting and helpful contributions to those deliberations it must do so on a statement and formula of principles, and not to attempt to discuss these principles in detail. There have been all sorts of proposals, ranging from taking German bonds in liquidation of allied debt in varying amounts, according to the convictions of the proposer. But it seemed to the Americans studying this question that, essential indeed as is the fixing of reparations and the treatment of allied debt within those terms which will enlist the efforts in good faith of those people to discharge those war burdens, above and beyond that the main consideration must be the settlement of them in so comprehensive and effective a manner that there will be established the conditions under which capital and investment will be protected and industry made to function.

Big Increase in Per Capita Earning Shows Value of Machinery

Now, of course, the reasoning by which this is given the prime consideration is something like this: That manifestly there has been demonstrated in the past few years an increasing earning power per capita throughout the world. For instance, in the twenty years prior to the war, before the war disturbed the measures by which we trace trends, the national earning power per capita annually of America increased by 116 per cent; Germany the next country, by 52 per cent; France by 21 per cent, and Great Britain by 21 per cent. In the United States the figures showing this tendency are even more marked, in that, whereas from 1850 to 1890, in forty years, our per capita earning increased from $100 to $200 or double in forty years, in the next thirty years it increased from $200 to $600 or treble. The same trend is present everywhere.

I think it will appeal to you, as being one which can be counted on as being a sound economical tendency and a lasting one, if you will consider this phase, the contribution which science and invention are making through mechanical processes, in the enlarging of the earning power of human effort. For instance, you will at once recall that within the last twenty years, by aid of various devices, the telephone and the telegraph, the automobile, the fast train, time and labor saving devices of all kinds and the standardization of output as the result of chemistry and engineering science, it is true that the superbrains of the country, the man with big directing energy and skill, can today direct twenty factories where his father could direct but one. Moreover, in the process of large-scale assembly, such as the automobile, which is distinctly an American accomplishment, the man with a low grade of mentality, who twenty years ago was out of work half the time and a burden on the community half of that idle time, is today doing a simple task in the process of assembling, earning the wages of a skilled mechanic, and certain of steady employment. He is earning more than he and his dependents are taking in current consumption. And between these two grades of productiveness all human labor earning power is so clearly increased that these statistics I have quoted to you appeal as clearly based on common sense observations as well.

The American delegation felt that if these European questions could be so treated as to create an atmosphere in which investments would be attracted, and industry would begin to function; if there could be established such a comprehensive settlement of these questions that the current war alarms would be eliminated, so that there could be a great expansion of human investment and therefore human employment, that this great process of increasing human earnings would lift these great after-war burdens with less distress than now seems possible. I think that this is the real contribution which America made in the discussions at Rome.

There was one other contribtuion which America initiated in the Rome conference, and that is born of our own experience, in the peculiar philosophy that production is greatly stimulated by mechanical aids. We found in these countries abroad a great reluctance to adopt mechanical aids to industry which have proved so remarkably effective in America. We found harbors in which all the commerce and all the passenger trains were handled by lighters. We found almost a scanty equipment of mechanical appliances in many factories. And we urged upon the Rome Conference the adoption of certain principles of production in the stimulation of trade, and after discussion the following principles for increasing production were adopted:

The adoption of every invention and mechanical device that offers economy of production.

The elimination of restrictions on individual output.

The stimulation of individual effort by payments which reflect the relative individual effectiveness.

The commending of the advantages of private ownership and operation as contrasted with the record made by State ownership and operation.

Taking immediate steps to divert men now engaged in non-productive pursuits into productive labor as soon as possible.

We found an extraordinary unwillingness to commit themselves to these particular principles at first, but afterward they were so sound and logical as the basis for earning production in Europe that they were adopted, and I shall hope that they will be made effective through the efforts of these twenty national committees who will try to put them into effect.

From a speech made at the Metropolitan Club, New York, Monday, April 16.

Air Travel Deemed Safe

How dangerous is it to fly? The insurance companies recently have issued what might be termed a bet of $25,000 to any man or woman who will fly, according to R. R. Blythe in an article published in the *Journal of the Society of Automotive Engineers*, at odds of 1,000 to 1, that he or she will arrive safely at the destination. The effect of such a bet as 1,000 to 1 is to prove that flying in a sound commercial-seaplane line is safe at the present stage, and that this rate will be reduced even further after future experience. Properly organized airplane-routes over land, having a sufficient number of intermediate emergency landing-fields, could easily secure this bet of 1,000 to 1 on the safety of airplane passengers.

Metal Cutting Tools

By W. E. SPLAIN

Factors affecting speed with which a tool cuts economically—Angles of tools for cutting different metals—Why round-nosed tools are best

AS FAR BACK as history can trace, men knew how to cut. In the Stone Age, rocks were shaped into weapons and tools by a crude process of cutting. The Indians cut stones with fish bones and made arrow heads from them. Today thousands of people are cutting wood, leather, stone and metals for a living and yet no one has ever been able to explain what really happens when a substance is cut. We know how to cut with the tools that now exist, but no man who has studied the art to any extent would attempt to explain what happens to a chip in the process of deformation. The basic laws of cutting are almost as remote today as they were a thousand years ago. A great amount of valuable information on the subject of metal cutting has been produced by such men as Taylor, Barth, White, Nicolson and others who showed how to get the best results with the available tools. It is evident from the shop practice of a great many machinists, that they are not aware of the valuable facts that these men have uncovered and it is toward this end that the article is written.

According to Taylor, who is the best authority on the subject of metal cutting, there are twelve things that affect the speed with which a tool can cut economically. They are:

(1) Quality of the metal to be cut;
(2) Diameter of the work;
(3) Depth of the cut;
(4) Thickness of the shaving;
(5) Elasticity of the work and the tool;
(6) Shape of the tool;
(7) Chemical composition and heat treatmentof the tool;
(8) Whether or not the tool is cooled with water or other cooling medium;
(9) Duration of the cut (the time a tool must last under pressure of the chip without being reground);
(10) Pressure of the chip on the tool;
(11) Change of feeds and speeds possible on the machine;
(12) Pulling and feeding power of the machine.

All of the elements have been combined into a long, complicated, mathematical equation, that can only be solved in a practical way by the use of a special slide rule. Most of these elements are entirely beyond the control of the machine operator. In fact, a careful study of the elements will show that those which the operator can change, in order to make a tool hold up under an increased cut speed, are:

(1) The shape of the tool;
(2) Depth of cut;
(3) Thickness of the shaving (dependent upon the feed);
(4) The tool, if not properly hardened;
(5) Application of water or other cooling medium in some cases.

Let us consider the shape of the cutting tool and how it affects the cutting problem. The forces exerted by the chip upon a unit area of the tool are enormous. It is therefore advisable to support this cutting edge with as much metal as possible, hence the clearance angle shown in Fig. 1 should be as small as possible and yet not drag. For all lathe tools, regardless of the metal to be cut, the clearance angle should be 6 deg. The average machinist grinds a lathe tool so that it has a clearance angle of about 18 deg. and his tool is unnecessarily weak.

The less side and back slope that a lathe tool has, the more the chip will be deformed in its removal, thereby causing more heat to be generated, which is of course the most important factor in the failure of a high-speed steel tool. On the other hand, the greater these angles become, the more danger there is of the cutting edge spalling off. Evidently there must be a pair of angles for each kind of metal that will give a cutting edge of maximum life. The angles that Taylor proposed after twenty-six years of experimental work are shown in the accompanying table.

PROPOSED ANGLES FOR CUTTING TOOLS

Material To Be Cut	Clearance Angle, Deg.	Side Slope Angle, Deg.	Back Slope Angle, Deg.
Spindle steel and cast iron	6	8	14
Tire steel	6	8	14
Soft steel	6	8	22
Harder than tire steel	6	5	9

The shape of the tool has a lot to with chatter. Chatter may be due to poor bearings but the tendency to chatter can be greatly reduced by the use of a properly shaped round-nosed tool. Chatter is vibration. The frequency of vibration of a tool depends upon the thickness of the chip it is removing. In the case of a straight-edged tool, such as a cutoff tool, the chip is the same thickness throughout its entire length and the tendency to chatter is great, but in the case of a round-nosed tool, there are no two points on the cutting edge where the chip thickness is the same. The frequency of vibration is therefore different at any two points of the cutting edge and the effect is to neutralize itself. It is therefore advisable to use round-nosed tools wherever possible. Fig. 2 illustrates a common fault found in hand-ground tools of this design.

A chip removed on a milling machine, increases in thickness as the cutting edge moves through the work. In this case, a straight-edged cutting tool removes chips of ever-varying thickness. Hence the tendency for a milling machine to chatter is much less than that for a planer.

It should be remembered that there are three ways for a cutting tool to fail:

(1) By wearing away the edge;
(2) By overheating;
(3) By a combination of the two, which is the proper way for a lathe tool to fail.

Every lathe operator has his own opinion as to the correct shape of his cutting tools and obviously all cannot be right. The shapes outlined in Fig. 1 were found by Taylor and his assistants to give the best results from the standpoint of removing metal at a fast rate and economically. Hence, they are the best shapes known as roughing work. For finish turning on a lathe, odd shaped tools are necessary, in order to get into corners. Here the operator must use his own judgment, but in general it can be said that 6 deg. is the ideal clearance angle for all tools, and wherever possible the

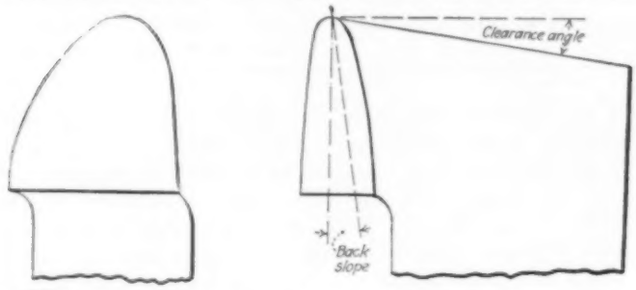


FIG. 1

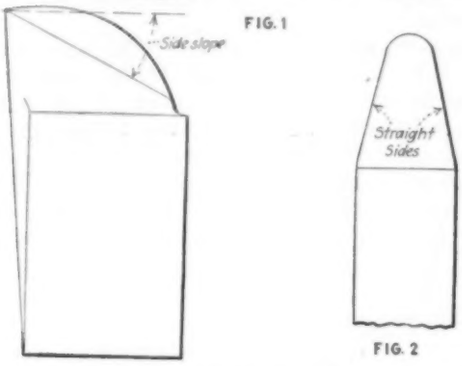


FIG. 2

FIG. 1—RECOMMENDED DESIGN FOR A CUTTING TOOL. FIG. 2—A TOOL WITH STRAIGHT SIDES, A COMMON FAULT IN HAND-GROUND TOOLS

side and back slope angles shown in the table should be employed.

In cutting bronze or brass, scientifically conducted experiments by the writer have proved that a round-nosed tool set on center, ground absolutely flat on top, will not gouge and will require less than three per cent of the vertical force on the tool to hold it against the cut and to feed it. The idea of using a negative back slope is erroneous. One degree of back or side slope will make the tool tend to gouge and one degree of negative back or side slope, will force the tool away from the cut. The most economical brass cutting tool that will not gouge, has no side or back slope.

When a considerable amount of metal is to be removed from a rigid piece of work, the operator can choose his feed and depth of cut, regulating the cutting speed to suit them. Whenever three things of this nature can be varied, there is usually some combination that gives the best results. Experiment has shown that a change in the feed when taking a cut has about three times as much effect on the cutting speed as a corresponding change in the depth of the cut. Hence the tool will remove metal faster when a deep cut and a light feed are used than when a shallow cut and a heavy feed are employed. With a given depth of cut, metal can be removed at the fastest rate by using a coarse feed and a correspondingly slow speed. These statements apply to all cutting tools.

Another aid in the art of cutting that is often neglected is the use of a cooling medium. When a chip is removed by a lathe the metal is completely broken down. It is apparently sheared, compressed, and torn apart but no one can say definitely just what has happened to it. Such deformation is accompanied by the generation of considerable heat. The tool is heated partly by the friction of the chip on the tool and partly by conduction of the heat from the hot chip. The chip is hotter than the tool. If, therefore, a stream of water or other cooling medium is directed against the chip, the chip is cooled and less heat is conducted to the tool. This method permits a higher cutting speed.

In the case of cast iron, the chips break off so short that very little hot chip is in contact with the tool, hence there is a relatively small amount of heat conducted to the tool when cutting cast iron. Contrary to the popular belief, however, the direction of a copious stream of cooling medium upon the cast-iron chips as they are broken away from the metal will permit a higher cutting speed. It is safe to say that with the use of proper tools and an ample amount of cooling water properly directed that an increase in cutting speed of 40 per cent can be obtained on mild steel and 12 per cent on cast iron.

The mechanic who can grind his tools properly and who understands the advantages of using correct feeds, depths of cut, and cutting speeds, is always in demand.

Catalogs for Brazil

BY V. L. HAVENS

Catalogs for Brazil should not have engraved nor enbossed covers nor inserts. The import duty on catalogs is 150 gold reis per kilogram (about 5c. U. S. gold) but on engraving is 4,000 gold reis or $1.93 per kilogram. The tariff on steel engravings and fancy engraved sheets should in no sense apply to catalogs, but it lies entirely in the discretion of the inspector to call the whole thing engravings if he wants to. This authorizes a heavy fine of which the inspector gets half and his superiors have not, in the instance under discussion, shown any disposition to keep the inspector from his fine income.

Catalogs should not be shipped by freight as five to six weeks are required to pass them through the custom house and storage must be paid during the time consumed.

Cartage must be paid and to mail them from Rio to any Brazilian post office costs four real per gram or 2½c. per pound. They should not be sent by Parcel Post as this is a new department of the Post Office and it is generally conceded that it is more difficult to get anything through that department than any other.

The easiest and quickest way is to mail the catalogs direct from the factory to the individual in Brazil. If the catalog is small it should be sent by first class mail; if it is large it should be sent as printed matter. If immediate sales possibility depends upon it, it should be sent by registered first-class mail.

On a four hundred lb. (gross) box of catalogs, 300 lb. net, I have been asked to pay custom house charges of $160 plus the ordinary cartage and handling to be expected from custom house to office. The freight from New York to Rio with invoice, cartage, etc., is about $30. The postage for mailing in Brazil would be $7, a total of about $200, or approximately 70 cents per lb. of catalogs. To this should be added six weeks' loss of time.

Management Methods and Principles of Frank B. Gilbreth, Inc.—IV

BY K. H. CONDIT
Editor, *American Machinist*

Function of management engineer to reduce costs, raise wages, increase profits—Seeing that the workman has material to work on—Principles of blank form construction

THE FUNCTION of the management engineer, according to Mr. Gilbreth, is to reduce the cost of production in a given plant to such an extent that both wages and profits in that plant can be raised permanently above the levels existing in similar plants in the same vicinity. If he succeeds in accomplishing these tasks the methods and devices employed are of no consequence. They are but means to the desired end.

It should be noted that wages are to be increased above those paid for similar work in neighboring plants which must tap the same sources of labor supply. It would hardly be a fair test to compare wages in Detroit with those in Birmingham, or living conditions in Fall River with those in Greenville.

The same reasoning applies to profits. Propinquity to sources of raw materials and fuel, and to markets, cuts a big figure when profits are being added up. A ten per cent profit made in one locality may require as much gray matter of the manager as a twenty per cent one in some place where conditions are more favorable.

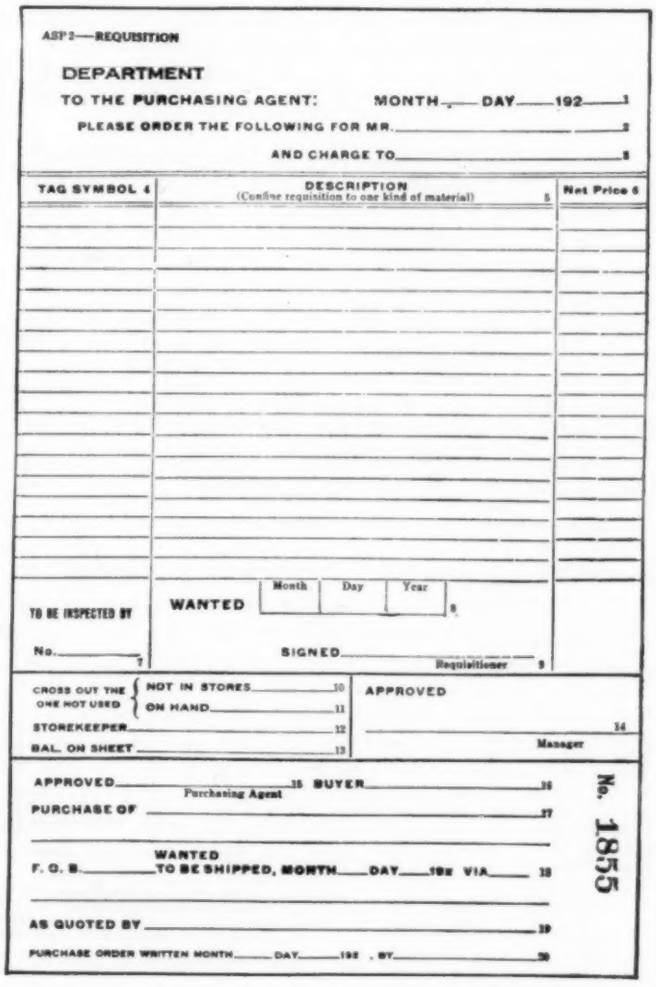
STARTING THE REORGANIZATION

While the methods employed by the successful management engineer may have no significance for the employer who retains him they are of considerable interest to the men whom they affect most, the executives and the workmen. The manager, the superintendent and the foremen are vitally concerned with anything that relieves their responsibility and helps them to show results. The workmen appreciate the fatter pay envelope and the acquisition of ways of doing their daily tasks with less fatigue.

I have shown in the preceding articles how the Gilbreth engineers survey a plant to find out exactly how it works and where it is working badly. The next step is to make a start at the reorganizing process. In selecting the point of attack it is good policy to pick out one where a killing can be made. The outsider who comes into a plant to show the men already there how to do their work better is naturally an object of suspicion. It makes no difference whether he is a consultant on a retainer or an "efficiency" man from the office of the company. The burden of proof is on him and he must show immediate results if he is to get the co-operation necessary for a successful completion of his undertaking.

The Gilbreth practice is to start in at as many places as possible where the operations are not in dependent sequence. It would be foolish, of course, to start in simultaneously on two departments where the work done in one depends on the methods employed in the other.

The first snag the engineer runs up against is the thing that can't be done. Experience is a wonderful teacher but it sometimes leads men astray. When a man, or a group of men, has tried repeatedly to reach the solution of a difficult problem he is apt to believe in the end that a solution is impossible. Just because a thing never has been done, however, is not a good


ASP2—REQUISITION

DEPARTMENT

TO THE PURCHASING AGENT: MONTH___ DAY___ 192___ 1

PLEASE ORDER THE FOLLOWING FOR MR.___ 2

AND CHARGE TO___ 3

TAG SYMBOL 4	DESCRIPTION (Confine requisition to one kind of material) 5	Net Price 6

TO BE INSPECTED BY

No.___ 7

WANTED Month Day Year 8

SIGNED___ Requisitioner 9

CROSS OUT THE ONE NOT USED { NOT IN STORES___ 10 / ON HAND___ 11

STOREKEEPER___ 12

BAL. ON SHEET___ 13

APPROVED___ 14 Manager

APPROVED___ 15 Purchasing Agent BUYER___ 16

PURCHASE OF___ 17

F. O. B.___ WANTED TO BE SHIPPED, MONTH___ DAY___ 192 VIA___ 18

AS QUOTED BY___ 19

PURCHASE ORDER WRITTEN MONTH___ DAY___ 192 . BY___ 20

No. 1855

FIG. 15—MODEL REQUISITION FORM

reason why it never will be done. It is up to the engineer to refute the arguments of experience and to do so he must find out why the object in question cannot be attained.

Mr. Gilbreth recommends writing down carefully all the reasons that anybody can think of why a thing can't be done and then finding a remedy for each one. Taken as a whole they are often formidable but attacked separately it usually turns out that every one has its vulnerable spot.

Checking Up on Material Supply

In the shop one of the first wrong things to be discovered usually has to do with the supply of work to the man at the machine or at the bench. Pieces or material may not be coming to him fast enough to keep him busy. It is equally possible for them to be coming too fast. Or perhaps they don't come at the right time and do come at the wrong time. Obviously the stores system should be investigated at once to see if it is functioning.

The actual physical surroundings and conduct of the stores department will vary with the size and type of plant and the product turned out but certain blank forms can be adapted with but slight modifications to almost any stores system. One of them is the requisition blank shown in Fig. 15. Note that every space that is to be filled in has a number which refers to a paragraph in the instruction book issued to every one in the plant who has any use for it. A man does not have to consult his instructions more than once or twice before he becomes familiar with the requirements of the form. The instructions and the numbers then are of no further use to him but they are there in case he dies or leaves or is off the job long enough to grow stale on details.

Note also that the requisition for stores goes through the hands of both the storekeeper and the manager before reaching the purchasing agent. The storekeeper can stop it if for any reason he desires to deviate from the standard "quantity to order," or if he believes that he already has enough of the material requisitioned on hand, a fact that may not have been known by the requisitioner. The manager can also call a halt if he is aware of some other reason for a change which may not be known to the others. Mistakes will happen regardless of the safeguards and therefore it is desirable to consult the storekeeper as to quantity actually on hand *at the time requisitions for purchase of additional stores are made* to see if his quantity agrees with the quantity on hand as shown by the balance of stores keeper's record—that is the time to check the inventory.

One other point. Waste space has been reduced to a minimum. The Gilbreths believe that waste paper in blank forms is as expensive as any other form of waste and seek to reduce it accordingly. One way of accomplishing this result is shown in Fig. 16, which gives the balance of stores form as applied to a particular plant. The instructions instead of being placed at the top of each column are printed in the binding margin which is otherwise waste space. Of course they are more difficult to read when so placed but, as observed before, they have to be consulted only once or twice when a new man takes hold of a job before he has them in his head and need think of them no longer.

The balance of stores or merchandise form is printed on both sides of the sheet, thus achieving economy of paper and of time because of the smaller number of sheets that must be thumbed over when a given item is being chased down. Provision for keeping a predetermined minimum always on hand is made in the space marked "1." The horizontal lines are spaced six to the inch so that the form can be filled in on a typewriter without hand spacing. This simple point is overlooked entirely too often when forms are laid out.

The headings and spaces on the forms shown in Figs. 15 and 16 conform to the requirements for blank forms laid down by the Gilbreths. They are as follows:

1. Provide all places necessary as reminders to the individual who must fill them out.
2. Let the printer make cheap marks wholesale rather than have busy executives make expensive marks retail.
3. Arrange the copy so that the individual can easily find the place he is to fill out.

Second Rule Most Important

These three rules are excellent ones to bear in mind whenever you decide to overhaul your blank forms or inaugurate new ones. Perhaps the second rule is the most important for it gets at the root of the reason for having forms. The complications of modern industry require what sometimes seems like an endless procession of reports, an essentially non-productive form of endeavor. Any means of lightening the burden of preparing the reports will release more of the executive's time for the job he is hired to do. Hence the printed form to relieve the reporter of everything but putting in the actual current figures sought.

ASM1—BALANCE OF MERCHANDISE — When Quantity Available Falls To ——— 1 — Issue Requisition For ——— 2 — SYMBOL

DESCRIPTION ——— 3

MERCHANDISE ORDERED To be made but not yet delivered to Storeroom 5							MERCHANDISE ON HAND In the Storeroom 6							MERCHANDISE APPORTIONED To Orders but not yet issued from the Storeroom 7				MERCHANDISE AVAILABLE i. e. Unapportioned Merchandise Ordered and on Storeroom 8			
Date of Requisition 9 Mo	Day	Requisition No. 10	Lot No. 11	Quantity 12	Date Rec'v'd from Shop 13 Mo	Day	Cost per Unit 14	Date Rec'v'd from Shop 15 Mo	Day	Lot No. 16	Quantity 17	Tag Ser'l No. 18	Date Issued 19 Mo	Day	Issued for Order No. 20	Date Apportioned 21 Mo	Day	Quantity 22	Date Issued 23 Mo	Day	Apportioned on Order No. 24	Date of Req'n for New lot 25 Mo	Day	Quantity 26	Date Apportioned 27 Mo	Day

NOTE—When Merchandise is Ordered, add the Quantity to Columns 5 and 8. When Merchandise Arrives, Subtract the Quantity Received from Column 5 and Add the Quantity Received to Column 6. When Merchandise is apportioned, Subtract the Quantity from Column 8, and Add the Quantity to Column 7. When Merchandise is Issued, Subtract Quantity from Columns 5 and 6. In all cases bring down at once balance on hand in each Column affected.

(This note is printed on the binding margin of the form.)

FIG. 16—BALANCE OF STORES OR MERCHANDISE FORM

Completeness of information is sought through the first rule. It is decidedly inefficient to have to send back reports for missing details to be supplied. The waste is not only of time but of temper as well. The third rule seeks also to eliminate the waste of time and patience occasioned by poorly designed forms which must be deciphered before they can be completed. Income tax return blanks might be cited as a horrible example.

Depreciation of a Lathe—Discussion

By L. L. Thwing

All Yankees have a right to answer one question by asking another, and I would like to answer A. W. Forbes' query, appearing on page 468, Vol. 58 of the *American Machinist*, regarding the depreciation of a lathe by asking him the following question: Do you want a figure that will indicate the physical condition of the lathe, and its relative fitness for the work at hand, or do you want a figure to set up on your books to be used as expediency dictates?

Until the year 1917 or thereabouts, the details of accounting were private affairs. So long as a manufacturer had no occasion or necessity to satisfy a sceptical banker that his books were a true record of facts, he was at liberty to manipulate his depreciation and expense accounts to suit himself. In playing the business game with these accounts "wild," there was a large amenable factor which could be used to foster or discourage dividends as expediency demanded. When it became a matter of active interest to the Treasury Department how the taxpayers' books were kept, the manufacturer was forced to standardize his accounting methods. The standardization was naturally left in the hands of an accountant, who used generally accepted rates and methods in such matters as depreciation. The accountant's job—among other things—is to keep the income tax down by using as high a rate of depreciation as is permissable. Now if one of Mr. Forbes' lathes has been depreciated at the rate of 10 per cent as recommended by the National Association of Machine Tool Builders, it will have a book value at the end of 5 years of 50 per cent of cost. This may or may not be its real value as a productive unit, but assume that it is. If the machine is actually in such a poor condition, the superintendent will either repair it or discard it. If he repairs it, so that it is practically as good as new, there is apparently no reason why it should not be restored to practically its original cost. This reasoning is on the assumption that there is no obsolescense.

When the labor and material slips for this repair get in to the accounting department, they may be marked by someone as to whether they are to be charged to repairs or to improvements. If they are so marked by a shop man, he is not likely to look at them as an addition to capital, so they go into the expense account. If they are not so marked at all, the accountant will have to allocate them. From his standpoint a repair or replacement is an expense, unless it adds materially to the life of the machine. It is not practical for him to find this out, so he adds it to capital during the dull years, and puts it into expense in prosperous years. Mr. Forbes will have to decide the question which appears above. In the present instance he should instruct his accountant to add the cost of the repairs to this lathe to its book value.

The All-Round Machinist

By Roy E. Bender

Occasionally articles and editorials are published in technical papers setting forth the fact that all-round machinists are getting scarcer every year and that within the next twenty years or so such mechanics will not exist. I will admit that an all-round man cannot earn as much money as a machine operator on a good piecework or bonus system, but that is not the entire story.

There always will be all-round mechanics for the reason that the work is interesting to the man who is mechanically inclined. Such a man would rather labor at interesting work than follow one monotonous operation week after week. The all-round man takes pride in his work and his time passes rapidly. The machine operator is a clock watcher and usually takes no interest in the shop, aside from his pay envelope. Thus the former man, incredible as it may seem, follows his trade because he likes the work.

Such a man sticks at his trade until he is a white-haired patriarch. His mechanical intuition would not permit him to become a mere machine operator only, no matter how attractive the pay. Again, the man who is trained on all-round work often lacks the necessary speed to qualify as a machine operator. Mechanical intuition is as old as human nature itself and as long as it exists, men will be found who are anxious to qualify as skilled mechanics on a diversity of operations. And do not overlook the fact that the man who trains himself for an all-round machinist is paving the way toward a foreman's or superintendent's position within a few years.

Adapting Orders to Your Employee's Temperament

By Frank V. Faulhaber

Said the foreman who has been securing satisfactory results from his employees for more than twenty years: "It is not a secret at all when you come to think of it. I have always believed that in order to get work done willingly and properly the man in charge of a department must think of his men as individuals, not as a force. And the foreman must, of course, set about his responsibilities accordingly. Whenever I want a certain man to carry out an order I give him that order as he would like to receive it."

Wise policy, indeed! Is there not here a keynote for other foremen in the machine shop where desirable results have not been achieved as wanted from all the men? The thoughtful executive will so phrase his command that the man directed will gladly do his work. For instance, there have been foremen who have used the same methods with all of their men; they will deliver an order harshly regardless of for whom it is intended. A harsh tone may work well in the case of the chap who is used to being spoken to roughly. But consider the mild-mannered individual. A command will be given to better effect in his case when of about the same tone as the man himself is wont to speak. Harsh men require harsh orders; the timid employees react most favorably to the soft-spoken command. It is merely a case of studying the employee, then applying methods accordingly so that each individual temperament is taken care of with a suitable command.

Ideas from Practical Men

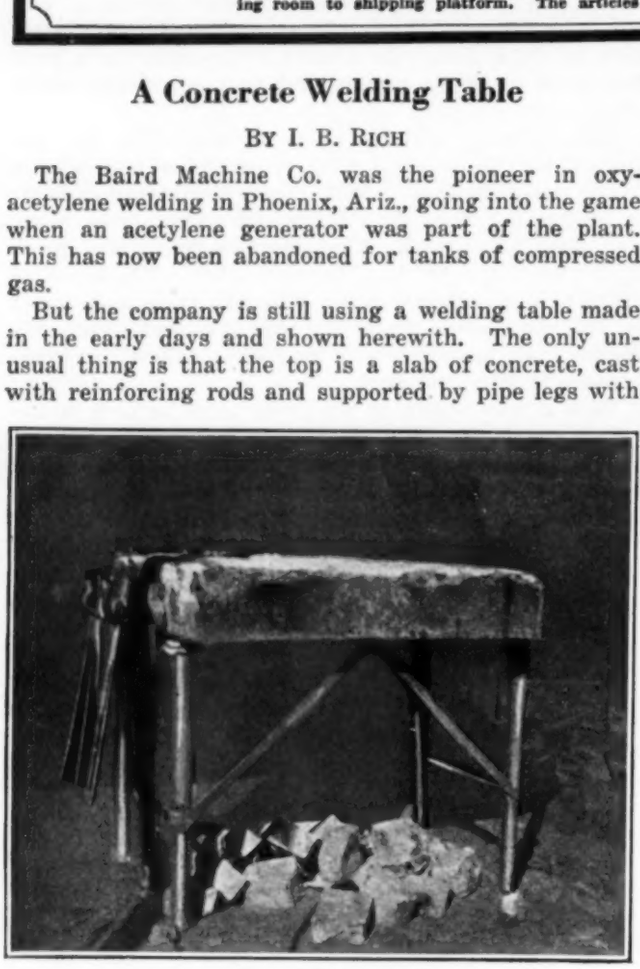
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Concrete Welding Table

BY I. B. RICH

The Baird Machine Co. was the pioneer in oxy-acetylene welding in Phoenix, Ariz., going into the game when an acetylene generator was part of the plant. This has now been abandoned for tanks of compressed gas.

But the company is still using a welding table made in the early days and shown herewith. The only unusual thing is that the top is a slab of concrete, cast with reinforcing rods and supported by pipe legs with



A CONCRETE WELDING TABLE

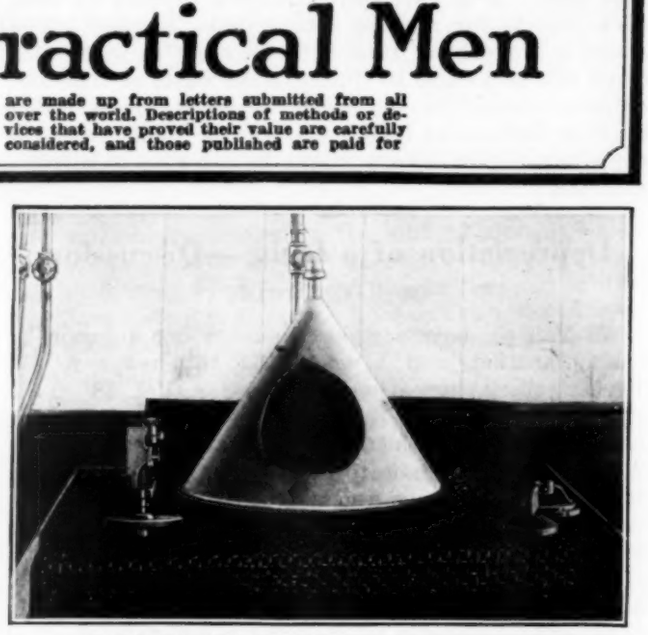
braces welded in place. A rack at the left end makes provision for tongs and similar tools.

The newer welding tables are made of firebrick mounted in a frame made up of angles as is now customary, but the old table is still on the job.

Gasoline Spray for Washing Off Oil

BY E. A. THANTON

It is common practice in many shops to remove oil or grease from small metal parts by dipping them into gasoline and slushing them around in the liquid. If the grease is at all sticky this isn't always a satisfactory way to remove it. In any case we found it unsatisfactory for our use and not wanting to resort to the use of caustics of any kind, we rigged up the outfit shown. This is merely an old tin funnel with a hole cut in it, fastened in an inverted position to the end of a pipe nozzle as indicated. Gasoline is forced through the pipe and spraying nozzle from a pressure tank outside the shop. The spray is easily controlled by means of a valve within reach of the workman. A piece of



GASOLINE SPRAY FOR WASHING OFF OIL

coarse wire screen is used on which to lay the pieces to be cleaned. The workman takes a piece, thrusts it through the hole in the funnel and lays it on the wire screen. One or several pieces may be cleaned at once. After the work is in place, the valve is opened and the force of the gasoline spray almost instantly cleans off the grease and dirt. Even the underside is usually thoroughly cleaned by the spray thrown back from the screen on which the work rests. As a rule the workman shuts off the valve before removing the pieces, but this isn't always necessary and sometimes, when only a little oil is to be removed the workman will hold the piece under the spray with his hand, turning it slightly as needed. A drain under the screen carries the used gasoline to a tank and it is afterwards filtered and used again.

Re-forging a Large Oil Drill

BY HENRY C. FRANCIS

Shops are erected in or very near the oil fields in the Los Angeles oil district. In these shops repairs can be made promptly. Promptness is important in the oil fields for when there is a gang of high priced drilling

HEAVY STEAM HAMMER FOR REFORGING DRILLS

men on the job, there must be as few delays as possible. The machinery must be kept going, and the drills working down, down to reach the oil beneath.

Some of the shops are well equipped with machinery, the oil activity having been responsible for a goodly proportion of the machine tool demand in the district the past year. As an example, take the heavy steam hammer, shown in the accompanying illustration, which is reforging a large flat drill for a local drilling gang in the Signal Hill district. This is the local shop of the Union Tool Co., whose main plant is at Torrance, several miles away.

These bits are handled easily and quickly by means of a threaded socket which fits the sharp tapered end of the drilling bit. The socket is supported by a chain from a jib crane, and has a four-spoked pilot wheel so that it can be easily and quickly turned. When the bit is hot enough to forge, the socket is swung over the furnace and screwed on by means of the wheel, a method giving the helper good control of the work and enabling him to hold it firmly for the hammer man or to unscrew the socket easily after replacing the bit in the fire.

Indexing Fixture for Grinding Master Cams

By R. Delrue

We have in our motors camshafts with 12 cams—say 6 inlet and 6 outlet cams—and we have, therefore, had to make 12 master cams on our Norton machine. Up to the present time these have been made by copying a hand-made camshaft which was tested in a trial engine and retouched until satisfactory results were obtained. I considered it a much better and cheaper practice to make only two cams—one inlet and one outlet cam—by hand, and to copy the masters from them. For this purpose I constructed the indexing fixture shown in the accompanying sketch, which is capable of giving me all possible positions of the cams.

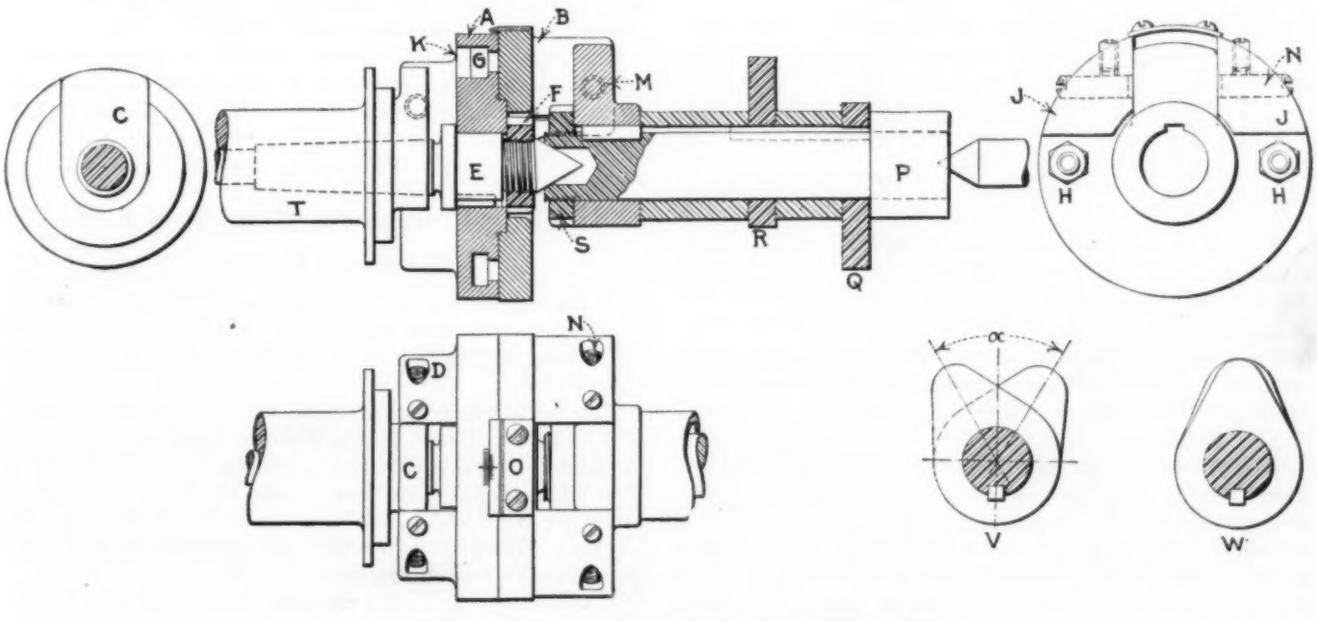
The fixture consists of a plate *A*, which is slotted to fit over the spindle nose *C* and is secured to it by means of the setscrews *D*. This plate is keyed to the center *E*, and is tightened by the nut *F*. A circuit slot *G* is turned in plate *A* and serves to retain the clamping bolts *H*, which are inserted through the opening *K*. These bolts project through the plate *B* and serve to tighten it on plate *A*. The plate *B* has a recess fitting a boss on *A* so that it may be rotated on the latter, and has two projections *J* to serve as carriers for the camshaft dog *M*, which is clamped in position by the screws *N*. Upon the upper part of the periphery of plate *B* is fastened the vernier plate *O*, while the circumference of plate *A* is graduated to 30 min. divisions; making settings of $\frac{1}{10}$ deg., or 6 min., possible.

The shaft seen at *P* bears the two hand-made cams *Q* and *R;* which are clamped by means of the nut *S*. After the system is mounted as shown in the sketch, all the master cams on the spindle can be ground to size by changing only the angular position of the cams *Q* and *R* according to the timing needed. We use two positions on the shaft *P*, as shown at *V* and *W*. In the first position the cams are set to the exact timing angle α.

To grind the masters on *T* it is only necessary to rotate plate *B* with the shaft *P*, $\frac{1}{6}$ revolution, or 60 deg., each time one inlet and one outlet master is ground to size. Of course extra care must be exercised in laying off the keyways to get them in exactly the required position relative to the center line. We use this method, however, for almost all of our cams, as it is most simple for the operator to index and reduces the danger of error to the minimum.

In cases of special masters or when we are not certain of our timing and more trial camshafts must be produced, each of them having a different timing, we use the second method as shown at *W*. Here the two cams have their axes in the same line, or at 0 deg. to each other. The operator in grinding the masters, must, of course, set the shaft *P* to the corresponding angular position for each of them.

By this method we eliminate the expensive hand-made multiple camshafts and, as all of our master cams on *T* are ground from the same models, each pair is necessarily exactly alike in shape.



INDEXING FIXTURE FOR GRINDING MASTER CAMS

Grinding Keyways in Multi-Splined Shafts

By K. A. Munson

The method described herewith was evolved some time ago as an emergency measure to grind some multi-splined shafts for which we had a contract, and so successfully did it let us out of our difficulties that the set-up has been allowed to remain in the lathe and has since been used extensively upon jobs other than that for which it was designed.

On the original job the contract called for seventy-

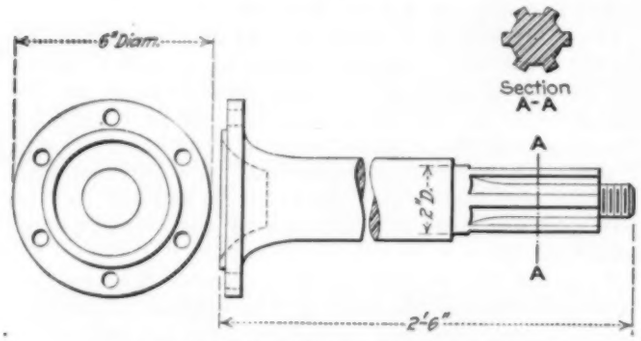


FIG. 1—SPLINED SHAFT TO BE GROUND

five special, heat-treated shafts of the dimensions shown on the drawing, Fig. 1. The limits were very close, but at the time the contract was made it was believed that the metal would not be so hard after heat-treatment as to preclude the possibility of finishing the pieces to size by means of a formed cutter. We were disappointed in this respect, however, as we found that the cutter would not stand up to finish even one spline, and we were compelled to devise some way to do the work with a grinding wheel.

The compound slide was taken off a 16-in. Prentice lathe and an angle iron, *A*, Fig. 2, fastened in its place. On this plate was planed the dovetail for the slide *B*, the screw and handle *C* serving as a means of adjustment. On the slide was mounted a small motor carrying a 6x½-in. grinding wheel upon its rotor shaft. All

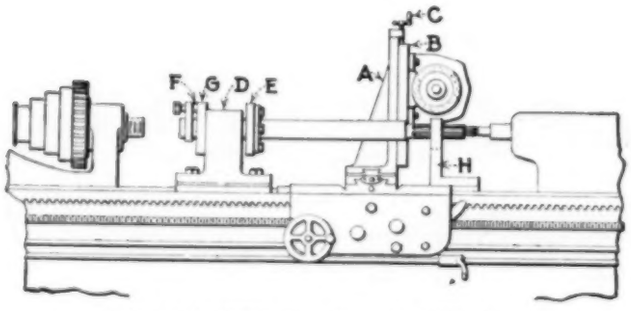


FIG. 2—LATHE SET UP FOR THE JOB

end play was carefully eliminated from the rotor shaft and the angle iron was so adjusted as to bring the center of the wheel in a vertical plane with the centerline of the lathe.

The bracket *D* was bolted to the bed of the lathe and bored out in place to take a short shaft on one end of which was the driving plate *E*, rabbeted and tapped to receive the flanged ends of the shafts to be ground, while on the other end was an arm *F*, carrying an index pin to engage with the six locating notches in index plate *G*, the latter being attached to the bracket *D*.

The wheel-shaping and truing device consisted of an angle plate, mounted as at *H* and shown in detail in Fig. 3, together with various-shaped blocks for holding the diamond. The V at the top of the angle iron *H* was so located as to come directly under the center of the wheel. The beveled sides of the wheel were dressed by passing the diamond holder *I* up and down each side of the V, setting the wheel down a trifle at each pass. The radius on the periphery of the wheel was secured by setting the triangular block *J* in the V and rotating the round diamond-holder within the block by means of a handle not shown in the drawing.

To traverse the wheel along the work the lead screw and nut of the lathe were used, the lathe being geared to secure the proper rate of traverse. In this type of lathe the lead screw is reversed by a lever on the apron of the carriage, and this lever gave us the means of controlling the traverse. After a little practice the control became quite easy.

After truing the wheel a roughing cut would be taken over all six splines of a shaft, this process being twice repeated. In dressing for the third, or finishing cut, it was found that the diamonds could be so set

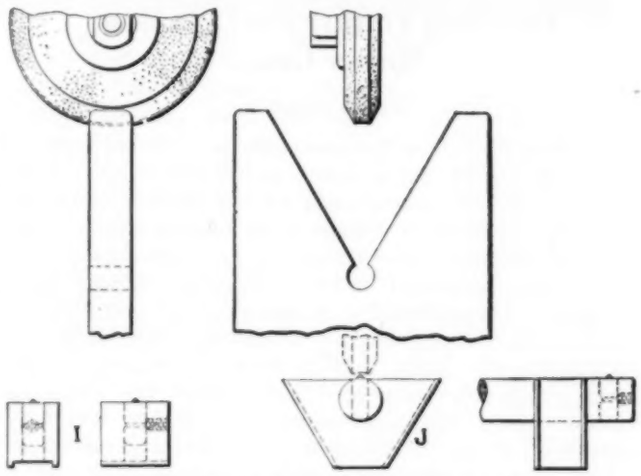


FIG. 3—DETAILS OF TRUING DEVICE

as to leave the wheel absolutely central and within a few thousandths of the correct height.

The arrangement described enabled us to get out the original seventy-five shafts at a reasonable cost and has since been used to grind many other shafts of other sizes.

Drilling Centers by Hand in a Lathe

By Charles F. Henry

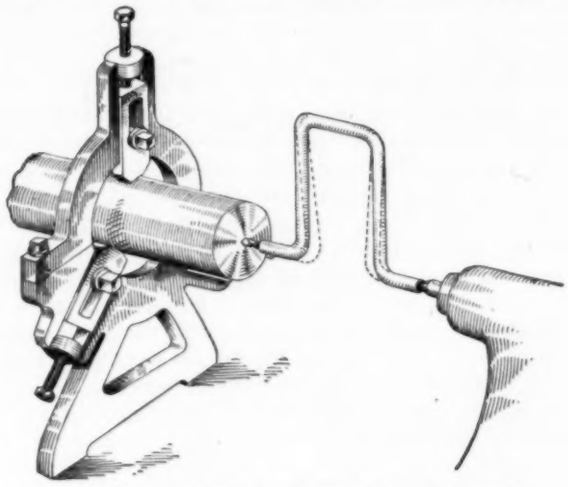
It sounds rather funny to talk of drilling centers by hand in a lathe, and yet that is exactly what I saw in an oilwell tool shop near the new oil fields of southern California.

The work was a large bar of steel, say 8 in. in diameter, which had been put in place in the lathe chuck and supported by the steady rest as shown in the illustration. The center drilling rig was a piece of about 1 in. round steel bar bent into something the same shape as a carpenter's brace. The crank was probably a foot long so as to give a good leverage.

One end of the brace carried a short twist drill and the other end was drilled and countersunk to fit the tail

center. The rest is easy to see as the lathe man drilled the center by turning the brace by hand just as a carpenter bores a hole. With a sharp drill it works very well.

The feed was obtained by feeding the tail center. This sprung the brace as shown by the dotted lines and



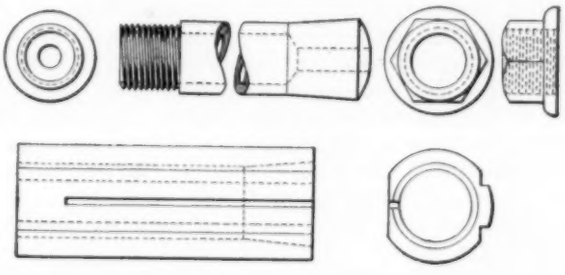
DRILLING CENTERS BY HAND IN A LATHE

the lathe man drilled until the spring fed the drill into the work enough to let the brace straighten out again. This method isn't recommended in place of a center drilling machine but it seems to have its place.

Fixture for Slitting Spring Collets

BY E. A. SISSON

An inexpensive fixture to hold spring-collet blanks for the purpose of sawing the slots may be made as shown in the accompanying sketch from a piece of round cold-rolled steel of sufficient diameter to allow for the milling of a rib or tongue along one side. The purpose of the tongue is to provide a means of



FIXTURE FOR SAWING SPRING COLLETS

holding the fixture in a milling-machine vise without distorting it.

To saw the blank, apiece of soft steel of the nominal diameter of the collet is put into the hole of the collet and the collet drawn tightly into the fixture with the nut. A line should be made on the face of the fixture 120 deg. from the top to facilitate resetting the collet after the first slot is sawed. The slot along the top of the fixture should not extend the full length, but only far enough to allow the saw to cut a sufficient length of the collet. In this way the fixture is tied together at the rear end and does not spring open after continued use.

Repairing Electric Car Wheels and Bearings

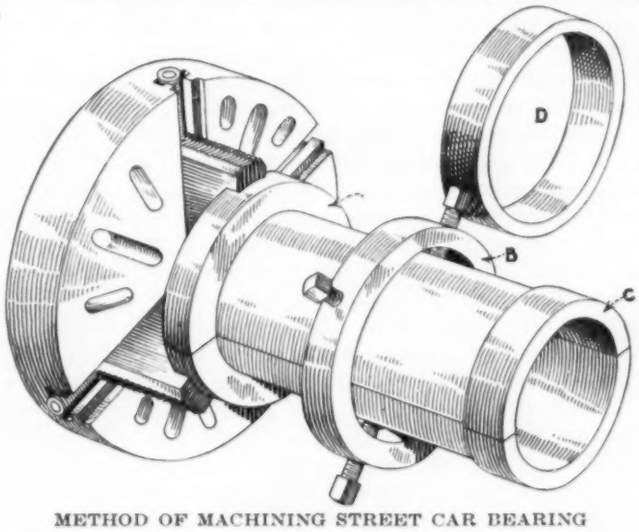
BY CLIFFORD H. FRENCH

Among the car brasses or bearings used by the Los Angeles Railway is one which has a relatively thin shell with a flange on one end. This bearing is made in halves and the illustration shows how the machining is done at the shop at Torrance, California.

The joints are faced and then clamped together by a steel ring having four set screws set radially and with the heads out. These four screws hold the two halves together during the preliminary operations.

After the bearing is clamped by its flange in the chuck *A*, with the ring *B* holding the halves together, the outer end is turned at *C*, so that the steel ring *D* can be forced over it with a light driving fit. Then the ring *B* is removed. The steel ring at the outer end not only holds the two halves but provides a bearing for the steady rest at that point.

This method allows the outside of the bearing to be turned and a single cutter boring-bar bores the hole to the desired diameter for the bearing. The flange also can be faced at this operation, leaving only the turning



METHOD OF MACHINING STREET CAR BEARING

and facing of the outside at the other end to be done after removing the bearing from the chuck.

Both chilled iron and steel wheels are used on this road, the latter prevailing on motor-driven cars. The chilled wheels are usually trued up on a grinding machine but this machine is not sufficiently heavy to handle the steel treads. These are turned, and it makes a very hard job for both lathe and tools. The shop men contend that the driving wheels are hardened by the frequent, if not constant, arcing of the current as it flows to the rails. In some cases where serious flat spots occur, the flat is filled by arc welding and then trued up. This method is not considered at all favorably by metallurgists who claim that the excessive local heating due to welding overheats the metal and starts cracks which may become serious.

Journals are not ground as there is no equipment for the purpose. They are rolled and a very good surface secured in this way. This process is also used in renewing worn bearings, a reduction of approximately $\frac{1}{32}$ in. being secured. Grinding of both tires and journals would seem to be the better method if machine equipment were available.

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Editors

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What Are the Factors Responsible for High Selling Cost?

ONE OF THE livest subjects of discussion in almost every business circle is the question of selling costs. It is even beginning to permeate the rarefied atmosphere of high legislative thought in Washington. The condition is acknowledged but what to do about it nobody seems to know.

The machinery industry is particularly troubled with high selling costs and for reasons some of which are completely out of its control. Perhaps if we set down a few of them and take up each one separately it may lead to better results than to go at the problem as a whole.

In the first place there is the keen selling competition of manufacturers with more capacity than the market can absorb. This factor is not peculiar to the machinery industry by any means but adoption of a misery-loves-company attitude isn't going to help any. Some people believe combination and elimination to be the only answer. Knowing the industry as we do we can see serious obstacles to be overcome before such a program would succeed.

Next comes the buyer whose boast it is that he is "hard to sell." Nobody will dispute his claim but almost everyone else understands that he not only adds to the cost of the tools he buys himself but to the cost of those the other fellow buys. Consequently he is not popular. Education seems to be the answer here.

And then comes the purchaser who must have special tools or equipment. It is often a matter of pride with him not to take a standard tool. The Waste in Industry report gave a faint idea of what lack of standardization is costing the country. Here again education must be resorted to both for user and maker, but it is a slow process as those interested in the progress of standardization can testify. The maker who has the nerve to cut out the slow selling sizes, price his good sellers right and drive hard on them through his field force and advertising will probably be surprised at the results he gets if he has never tried it before. The buyer who will co-operate will also be surprised at the saving to him.

One more big item in the high cost of selling is the abuse of free service. A reasonable amount of such service is essential. It varies in quantity with the complexity of the product. Such service is expected by the progressive user who understands that it is included in the cost of the machine he buys. It is to the advantage of the manufacturer to give service to the extent necessary to insure that his machine is given a fair chance to do what he claims for it. So far both parties to the controversy are in accord, but when it comes to calling upon the maker to send a service man half across the continent without charge to tighten a loose belt or make some equally elementary adjustment there is likely to be a difference of opinion.

In the same category are the customer who demands engineering data on the machine he buys which will cost hundreds of dollars to arrange in the way he wants it, and also the one who persuades the manufacturer to put in machines on trial operated by demonstrators paid by the manufacturer. The crying injustice of this form of service abuse is that the cost of it must be spread over the whole product and the innocent pay for it as well as the guilty. What can be done about it? Charge for it and charge all that it is worth.

The last two points we have taken up are ones for the machinery builders to settle but they are equally vital to the user of machinery for he pays the freight. If he will play fair in the matters of service and standardization he may expect generous treatment from the seller. In any case he pays for what he gets.

Selling Machines In Unusual Places

MOST OF US realize that machine tools are at the foundation of all modern industry. And yet we are very apt to consider only shops which make machinery of some kind or handle jobbing work, as possible buyers of machine tools. Machine tool builders and dealers have not, for the most part, learned what the salesman of a city on the Pacific Coast has discovered for himself.

"If I depended on the regular machine shops as customers for the machines I sell, I'd have sold mighty few this past year," he said. Few machine shops had been buying because few were using all they had or had money enough to buy new ones. Acting on this basis he started to hunt up other lines and as a result had a very fair year's business. Hotels, laundries, candy factories, garages, mining and logging camps, all contributed their quota to his list of sales, and his list of prospects is by no means exhausted.

From the factory point of view these are small sales and comparatively insignificant. For any one machine the total would not make a very large showing on the production chart. But the total for the industry is by no means insignificant for it helps to swell the grand total of over five millions a year for the three Pacific Coast states.

This is not a territory or a business for the sales engineer who must figure out production on close margins in any territory. The sales cost is usually too high when but a single line of machines is represented. It is essentially the work for a salesman who sells several lines of machines and probably small tools and supplies as well.

Production managers naturally like to see orders in quantities so as to keep the machines all in operation on regular schedules. But, as many builders know to their sorrow, it is much better to have orders for single machines dropping in with fair regularity than to have the large orders stop with nothing to take their place. Aren't they worth the effort it takes to get them?

Shop Equipment News

Gardner No. 2 Automatic Double Grinding Machine

A number of improvements and devices have been added to the Gardner automatic double grinding machine described on page 43, Vol. 56 of the *American Machinist* and manufactured by the Gardner Machine Co., Beloit, Wis. The machine, shown in Fig. 1 and known as the No. 2 automatic double grinding machine, has 18-in. abrasive wheels. It is intended for the rapid grinding of pieces having two parallel sides that require finishing, being adapted to the grinding of piston rings, ball and roller races, adding-machine parts, thrust washers, gear blanks and similar parts.

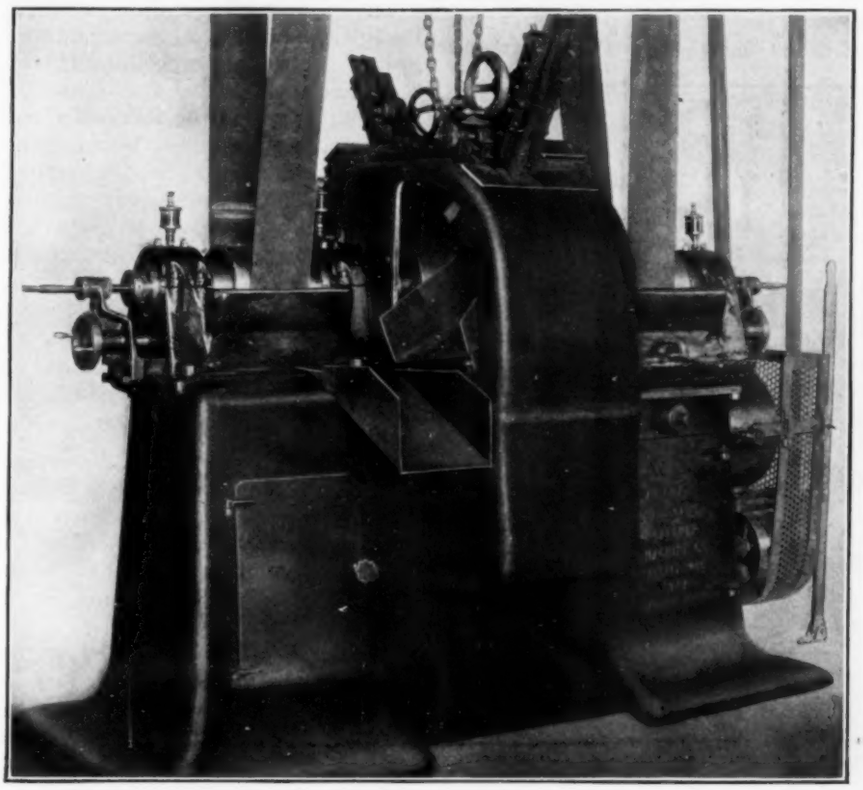


FIG. 1—GARDNER NO. 2 AUTOMATIC DOUBLE GRINDING MACHINE

The parts to be ground are carried to the working position by means of a work carrier shown in Fig. 2, which passes between the grinding members. These members are mounted on spindles which are offset in relation to each other, so that the grinding operation is done on the back face of one wheel and the front face of the other. A variety of work may be accommodated, since the carrier is provided with a range of feeds varying from 15 to 16 pieces per min., and by changing the pulley on the countershaft with a range of feed varying from 4 to 15 pieces. From 6 to 12 openings may be furnished in the carrier, of any shape to suit the work to be ground. Special carriers may be made where the operator loads and unloads as the work is ground, and in this way the machine becomes semi-automatic in operation.

As the carrier brings the work into the grinding position, one of the grinding members automatically advances until it reaches a positive stop. This member advances only as rapidly as the stock is removed, since it approaches the work under an adjustable spring pressure governed by a cam, and thus is prevented from overloading. The action of the same cam returns the member to the open position, and the work as it passes between the wheels is automatically unloaded.

The grinding heads are mounted upon sub-bases that are adjustable by means of a handwheel operating through a screw, graduations being provided up to 0.001 in. When a greater distance is desired between the grinding members than the screw adjustment will permit, the sub-bases can be adjusted along the main base of the machine. In addition, the right-hand head, during the grinding operation, has a lateral movement governed by spring pressure, as just explained. In accomplishing this lateral movement, the head slides upon ways which are provided with shields for excluding foreign matter.

The grinding members consist either of 18-in. steel disk wheels faced with heavy-type G.I.A. disks or 18-in. in diameter abrasive ring wheels carried in "Perfection" chucks, for dry or wet grinding, respectively. Steel collars carry the thrust on the members. When grinding small work such as piston rings, thrust washers and ball races that permit of a high rate of feed, an automatic feeding device for the carrier, shown in Fig. 3, is employed.

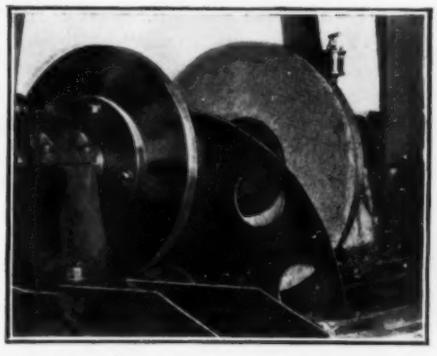


FIG. 2—ARRANGEMENT OF ABRASIVE WHEELS AND WORK CARRIER

A cast-iron hood guards the grinding members. Devices for truing the members are integral with the

machine and are mounted upon slides carried by the hood. Lateral adjustment to compensate for wear is obtained by means of a screw. During the dressing operation the dresser travels in a vertical slide and is operated by a handwheel working through a rack and pinion, which mechanism can be seen on top of the hood.

A feature of the machine is the

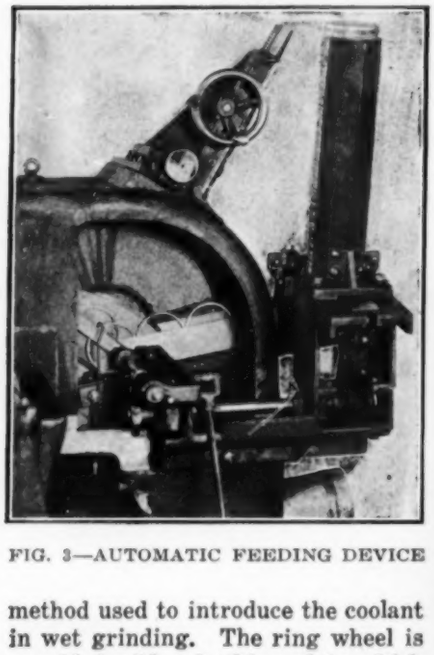


FIG. 3—AUTOMATIC FEEDING DEVICE

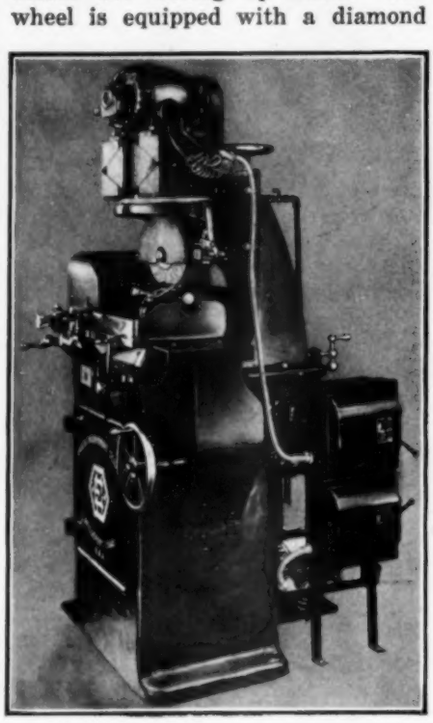
method used to introduce the coolant in wet grinding. The ring wheel is provided with a backing plate which is part of the hollow shaft running through the entire length of the spindle. This hollow shaft serves as a tube to carry the coolant, connection being made at the outer end with the pump. The tube is provided with a number of holes at a point just behind the backing plate, through which the coolant is ejected. The arrangement thus provides for a complete flushing of the wheel, since the coolant is supplied at the center instead of at the periphery of the wheel. For dry grinding an exhaust system is attached which removes all dust and particles generated by the grinding operation.

The machine requires a floor space of 4x8 ft. for operation. A 15-hp. motor drives the 20x14-in. driving pulley on the countershaft at 560 r.p.m., which shaft in turn drives the 8x7½-in. spindle pulley at 1,400 r.p.m. The maximum distances between disk wheels and ring wheels are, respectively, 12 and 6 in. The wheels are each driven by bronze-bushed alloy-steel spindles 29 in. in length and located 40 in. from the floor. Boxed for domestic shipment the machine occupies a volume of 219 cu.ft. and weighs 4,250 pounds.

Harris No. 415 Fully Automatic Hob Grinding Machine

The Harris Engineering Co., Bridgeport, Conn., has recently placed on the market the No. 415 motor-driven fully automatic hob grinding machine shown in the illustration herewith. It is similar in principle to but smaller in size than the No. 815 machine described on page 190, Vol. 56 of the *American Machinist*.

A motor is mounted directly over the spindle of the grinding wheel, being connected by belt to the spindle and provided with wedge blocks for taking up slack. The wheel is equipped with a diamond



HARRIS NO. 415 FULLY AUTOMATIC HOB GRINDING MACHINE

truing device attached to the wheel head, which swivels with the wheel when the latter is changed in its angular position by means of an overhead turntable that is graduated in degrees to suit hobs having helical flutes. Vertical adjustment to the grinding wheel is obtained by a hand wheel at the top of the column, and lateral adjustment through a ball crank handle.

The table reverse, spiral generating mechanism, indexing mechanism and hob feed mechanism are driven automatically by a motor mounted on integral brackets at the rear of and integral with the base of the machine. This motor also serves to drive the pump. The starting switches of both motors are of the enclosed safety type and are mounted on a guard at the back of the machine.

This machine grinds automatically straight fluted and either right- or left-hand helical fluted hobs, by means of a mechanism which indexes automatically, and also feeds the hob against the wheel rotatively after each complete revolution of the hob. The feeding mechanism is so designed that it does not have to be set for a different number of flutes in the hobs, but is actuated at each complete revolution of the hob holding spindle. The rated capacity of this grinding machine is for hobs 4 in. in diameter and 5 in. long. Hobs somewhat larger may be ground, however, especially if the teeth are fine.

A belt drive may be furnished, but it is not recommended because the motor drive offers less vibration. Lubrication of moving parts is provided for by means of oil wells and cups leading to the running parts by oil tubes. A safety device is also furnished to prevent injury to the mechanism in case of accident.

Ampco Bronze

Final improvements and tests having been completed, an alloy of copper, aluminum and iron, known as Ampco bronze, has been placed on the market by the American Metal Products Co., 34th Ave. and Burnham St., Milwaukee, Wis.

Ampco bronze is made in several grades and is intended for use in the manufacture of metallic packing, bearings, bushings, gears, worms, valves and fittings, pickling equipment, chemical apparatus and the like. The grades vary in hardness from a very soft bronze to one that is harder than chrome-nickel steel, the latter grade being practically non-machinable.

The metal is from 15 to 20 per cent lighter than ordinary bronze and is 3 per cent lighter than steel. It ranges in hardness according to grade from 15 to 55 Shore scleroscope reading, corresponding respectively to hardened copper and steel. The tensile strength ranges from 50,000 to 100,000 lb. per square inch, according to grade.

The metal can be cast, forged, rolled or drawn, and when subjected to friction will form an unusually hard, smooth surface. In the harder grades it is said to be extremely re-

sistant to the action of most commercial acids and alkalis, and will not pit. Its heat-resisting qualities adapt it for uses such as automotive poppet valves. It is readily machinable in all grades except the hardest.

Brubaker Spiral-Fluted Staybolt Tap

W. L. Brubaker & Bros. Co., Millersburg, Pa., has recently placed on the market a patented staybolt tap as an addition to its line of boiler tools. The chief feature of the tap is the spiral flutes for both the reaming and threading portions.

After the tap was designed, tests were run on it for over three years on actual work in several shops to determine its merits. The results obtained were remarkable, it is claimed by the maker, and six distinct features appeared which proved the tap to have a decided advantage over any tap that the Brubaker company had made prior to this time. The following are the points in which advantage is claimed:

In the first place, the tap is designed with a degree of taper which has been proved by test to have an advantage over other tapers. This construction increases the life of the tap about 20 per cent, as nearly as can be judged from results of the tests. The taper aids in distributing the work along the entire length of the tap, so that no part of it has more work to perform than any other part.

BRUBAKER SPIRAL-FLUTED STAYBOLT TAP

Second, the construction of the tap helps in eliminating vibration, which is the direct cause of breakage. This decrease in vibration, in addition to decreasing the cost of tapping, also decreases the amount of man power needed to hold the tap in place while in operation. More holes can be tapped per day per man because the tap, instead of vibrating at high speed, will run smoothly in comparison with taps of the former design.

In the third place, the tap has a free cutting edge; and it was found that the motor speed could be increased without injuring the tap because the friction which the average tap is subject to was practically eliminated. The presence of excessive friction will generate heat, which will cause the tap to get soft spots. The tap will then dull at these soft spots until it is practically ruined. The presence of heat means that energy is being extended to generate it. Since the tap eliminates heating to a large extent, power is saved and can be directed to the actual working of the tap, so as to cut down the amount of power required to tap a hole.

Fourth, special relief was determined and standardized for the tap. It was found that the ordinary machine relieved taps could not meet the requirements necessary to eliminate chatter; hand relieved taps were objectionable because no two taps could be relieved alike. The relief employed is a compound relief consisting of machine relief aided by a special machining operation. The relief of every tap is thus uniform.

In the fifth place, the company after trying commercial steels developed a steel of a special analysis in order to eliminate breakage. Tests of this steel, which has been used in the styles of staybolt taps formerly made by the concern, are said to show that it can do more work than steels of other analyses.

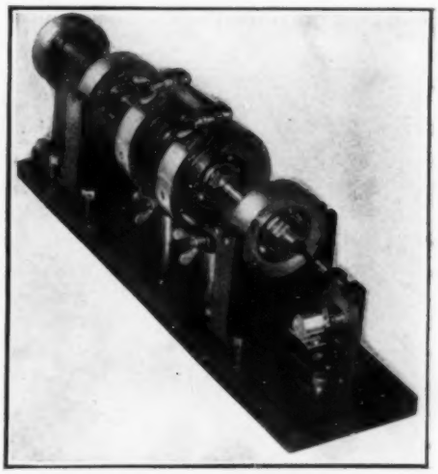
The sixth point, which is very important, is the temper. In order to keep the tap within the lead tolerances after it was machined, it was found that a special tempering process was necessary, giving due regard at the same time to the cutting qualities of the tap. Tests were arranged and fractures made of different taps to determine just what tempers should be used. The tap is tempered so that there will be very little shortening or gain in the lead of the thread, at the same time giving the tool the proper cutting quality and a soft center, the latter to prevent brittleness.

The spiral-fluted staybolt tap is made in all styles to meet all requirements of a staybolt tap. As with the former models of tap, it has 12 threads per inch, and is made in stock diameters from ¾ to 1½ in. and in stock lengths from 18 to 54 inches.

Bultman "Farmer Type" Fatigue Testing Machine

A device has been developed by the F. H. Bultman Co., Cleveland, Ohio, which records the number of alterations of stress which may be applied to a specimen before it is destroyed. It is known as the "Farmer Type" fatigue testing machine.

The machine consists of a 20x5 in. base plate with a housing in which



BULTMAN "FARMER TYPE" FATIGUE TESTING MACHINE

are mounted ball bearings for carrying the specimen in a horizontal position. The equipment is driven by a motor through a pulley mounted on a shaft which runs in bearings in another housing. Two suitably mounted ball bearings are also provided which are put on the specimen to carry the weights that apply the load or stress to the specimen. All the ball bearings are provided with easily adjustable compensating chucks to fit the specimen.

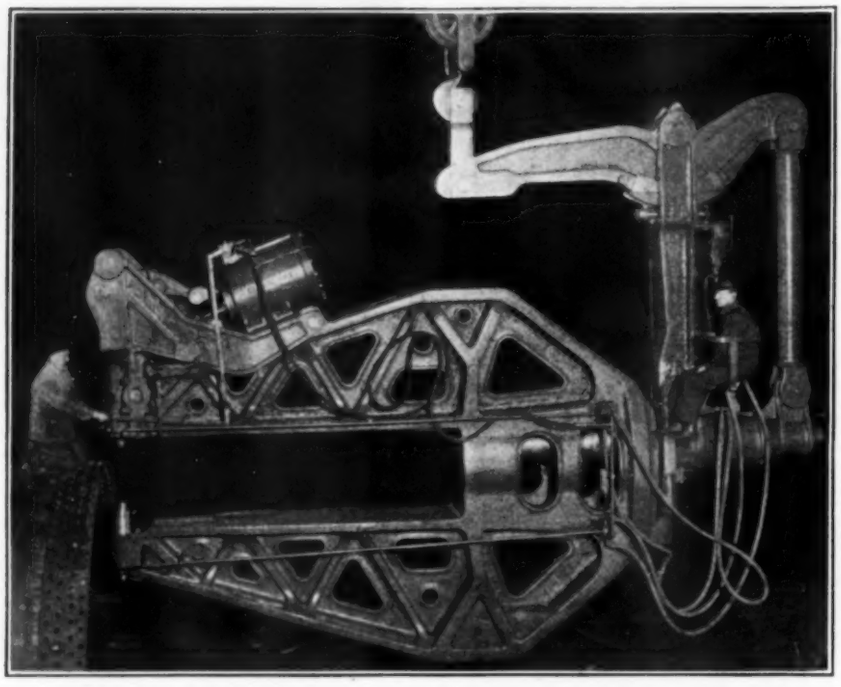
At one end of the machine is a bracket carrying a revolution counter, which records the number of revolutions made by the specimen under test up to the time of failure. The specimen is connected to this counter by means of a flat notched bar, which is so arranged that when failure occurs it will fall out of position and cause the counter to stop, thereby insuring a correct reading. Also, when failure occurs the broken specimen swings out of contact with the driving shaft and prevents the possibility of damage to the machine.

The weight of the machine, packed ready for shipment, is 54 lb. The loading weights required and motor are not part of the equipment.

Hanna 150-Ton Portable Pneumatic Riveting Machine

The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has recently completed and shipped the 150-ton portable pneumatic riveting machine shown in the illustration herewith, for use particularly when riveting the plates forming the volute of the casing and penstock on a hydraulic turbine.

A feature of the machine is its universality of application. It is possible to revolve the frame around



HANNA 150-TON PORTABLE PNEUMATIC RIVETING MACHINE

on the spindle out of its vertical plane and also to tilt it upward or downward to an angle of 30 deg. from the horizontal.

The supporting mechanism is so built that when the frame is revolved around the spindle or tilted upward or downward out of the horizontal, the center of gravity of all the parts hanging from the frame hook is neither raised nor lowered. This condition has been obtained by means of the suspension beam at the top, the two vertical links, the spindle housing and the spindle, all of which together form a parallelogram with the overhung support attached to the crane hook directly above the center of gravity of the entire machine.

The two motions, revolving and tilting, are performed by two reversible close-quarter, air drill motors of approximately 2 hp. each. The motor for rotating is mounted upon the spindle housing and drives a full wormgear on the frame, which construction allows the frame to be set at any required angle around the spindle. A means is provided for absorbing the shock of stopping the heavy frame. The tilting motor is mounted on the inner vertical link, which is in tension, and drives a wormgear which engages with a wormgear sector upon the suspension beam. Roller and ball bearings are employed at all points of rotation. The roller bearings on the inner vertical link carry a load of approximately 150,000 pounds.

The Hanna motion, or riveting mechanism mounted upon the machine consists of a combination of toggles, the actions of which merge into a lever action, developing a known and predetermined maximum pressure during the lever action, which is the last half of the piston stroke, or what amounts to the last 1 in. of die travel. The mechanism is claimed to insure tight rivets without requiring any adjustments of the die screw to care for variations in the sizes of the plates, rivets or holes.

Other features of the machine are the demountable head or rivet driving mechanism, and the movable buck-up or dead die. In the latter, sets of crown cams, one set on the die and the other on the frame, serve to raise the die when it is given a motion of rotation of 60 deg. When in this raised position, the die is supported upon flat surfaces, normal to its axis.

Complete manipulation of the machine is possible from one position at the head, three valve operating handles being located there for riveting, rotating and tilting. A seat is provided near the rear of the machine from which the rotating and tilting motor valves may be manipulated when operating conditions make this point of control more desirable. In the latter case, the standard reversing valves are used on the motors.

The total weight of the riveting machine is 57,750 lb., and the weight of the frame without spindle or riveting mechanism is 33,000 lb. The machine has a reach of 118 in. and a gap of 30 in. The truss form of the frame should be noted, as the construction is employed to give both strength and proportionate lightness of weight.

Grand Rapids Bench Twist Drill Grinding Machine

The motor-driven twist drill grinding machine shown in the accompanying illustration is a recent product of the Gallmeyer & Livingston Co., Grand Rapids, Mich., successor to the Grand Rapids Grinding Machine Co.

The machine is equipped with a diamond truing device for dressing

GRAND RAPIDS TWIST DRILL GRINDING MACHINE

the wheel. This device also automatically places the drill holder in the right relationship with the grinding wheel. A stop is provided to prevent bringing the front of the

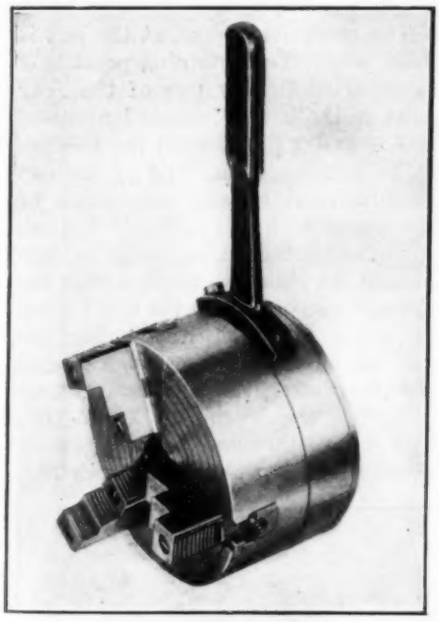
holder up against the grinding wheel.

A ½-hp. motor of either a.c. or d.c., single-phase or polyphase type, which can be driven from a lighting circuit or power line, is supplied. The motor bearings have adjustments to take up radial and end wear, which adjustments provide a means of preventing end play. The swivel bearings are bronze bushed with means for eliminating dust and supplying clean lubrication.

Two types of machines are available, the A-7-T and B-7-T. The former, illustrated herewith, has a capacity for drills of from No. 52 to ¾ in. The latter is made with a drill holder having a capacity of from ¼ to 1½ in. drills.

Foster-Barker Improved Wrenchless Chuck

For the purpose of increasing production and producing a more powerful gripping device the Foster Machine Co., Elkhart, Ind., has recently



FOSTER-BARKER IMPROVED WRENCHLESS CHUCK

made several improvements in its Foster-Barker wrenchless chuck.

The special feature is that the chuck is now double acting and will grip both externally and internally. The improvement eliminates the use of springs for returning the jaws when releasing; this result is obtained by employing grooved cams instead of cams with external lobes only. It is claimed that the time required for chucking is much less than that of the scroll chuck as the improved chuck can be opened and closed while in motion, and when the work is not too heavy it can be removed from the chuck while slowly coming to rest.

In this type of chuck the rear casing is kept stationary, although the body of the chuck is revolved by means of the lathe spindle. The position of the jaws can be adjusted by the lever mounted on the ring as shown, the action taking place through two sets of planetary gears. The jaw movement at each end of the travel is slower than through the greater part of it, thus enabling both rapid action of the jaws and tight clamping of the work.

Both independent and universal adjustments are provided for the jaws, the latter being responsive to the movements of the lever. The master jaws are provided with dovetails to accommodate false jaws suitable for the work to be handled. Non-adjustable manufacturing type jaws may also be furnished.

Both three-jaw, as shown in accompanying illustration, and two-jaw types of chuck are available. The former type is made in seven sizes ranging from 6 to 21 in. in diameter and weighing from 29 to 400 lb. The latter is made in five sizes ranging from 6 to 15 in. in diameter and weighing from 27 to 160 pounds.

Bultman Izod Impact Testing Machine

The accompanying illustration shows an Izod impact testing machine which tests the ability of steel or any other material to withstand a sudden shock or blow. It is built by the F. H. Bultman Co., Cleveland, Ohio.

The machine consists of two "A" frames secured to a base; a pendulum mounted on ball bearings, which swings between the frames, and which is provided at its lower extremity with a hardened tool-steel bar for breaking the specimen to be tested; a dial at the top of the machine graduated to represent the foot-pounds of energy consumed in breaking the specimen; a trigger to hold the pendulum at the proper height and release it when ready for the test; and a rest for the pendulum when the test is being prepared.

The operation is as follows: The specimen is made 10 mm. square in section with a specified notch cut on one side. Then it is placed in the vise with the notch on the side where the pendulum strikes, taking care that the center of the notch is even with the top of the vise. The vise is locked tightly by means of a nut. After raising the pendulum up to the releasing trigger, it is released by the trip and allowed to swing and strike the specimen. The reading on the dial is then taken, which gives the energy required to break the specimen.

The pendulum is 4 ft. long and weighs 60 lb. Since it is raised 60

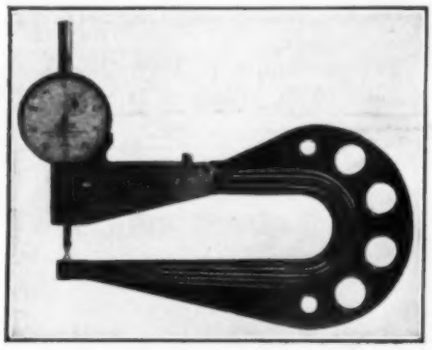
BULTMAN IZOD IMPACT TESTING MACHINE

deg. to the releasing trigger, which is 2 ft. above the lowest level of the swing of the pendulum, it produces a striking force of 120 lb. against the specimen. If the pendulum swings unimpeded, it rises to the same height as the trigger on the other side, and the dial at the top reads zero. But when a specimen is inserted in the vise, the breaking of the specimen absorbs some of the energy of the pendulum and causes the latter to fail to rise to the full height of its unimpeded swing. The dial reads directly the number of foot-pounds of energy used in breaking the specimen.

A floor space of 4x10 ft. is required for operating the machine, with the foundation occupying 18x48 in. The overall height is 6 ft. 6½ in. and the total weight 1,200 lb. It is recommended that the device be bolted to a solid foundation of concrete using bolts of ¾ in. diameter.

Federal Dial Thickness Gage

A gage for indicating variations in thickness of material of any kind above and below a set standard by increments of 0.001 in., has been brought out by the Federal Products



FEDERAL DIAL THICKNESS GAGE

Corporation, 15 Elbow St., Providence, R. I., and is shown in the accompanying illustration.

The frame of the gage is of steel with a wide rib around the throat to insure rigidity. Holes in the rib serve to lessen the weight and are convenient for handling the tool. The measuring points may be made of any desired shape to suit whatever material is to be gaged, and will register variations from zero to ¾ in., which latter is the maximum capacity of the tool. The anvil is adjustable to compensate for wear.

The dial is stationary and is graduated in 100 divisions, each division representing 0.001 in. A "second hand" on the face of the dial registers the number of complete turns made by the main pointer, and the actual thickness of a piece of material between the measuring jaws may be read in decimals directly from the positions of these two pointers.

An important application of this tool in automobile shops is to measuring the thickness of wall of pistons under the ring grooves.

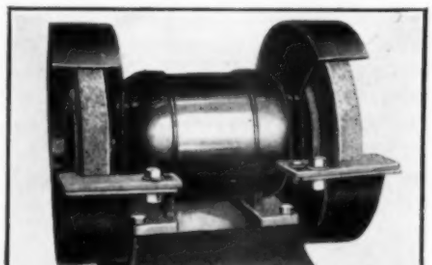
Westinghouse No. 238 Micarta for Small Gears

The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has developed a new grade of Micarta, designated as No. 238, for use in the manufacture of gears and pinions of small pitch and face width, such as are used in phonographs and magnetos. The new Micarta is made from a good grade of fine fabric and, because of this feature and its densely homogeneous structure, can be machined very accurately. For this reason it is adaptable to fine pitch applications, particularly in small motor-operated machines, where the gears must run silently with a high operating efficiency.

Forbes & Myers Model 102 Bench Grinder

Welded steel guards and tool rests are features of the Model 102 grinding machine recently developed and put on the market by Forbes & Myers, 172 Union St., Worcester, Mass.

The guards and rests, as shown in the illustration herewith, are held to the motor frame by four nuts which thread over the stud extensions. A fully enclosed motor of the squirrel-cage induction type is supplied for voltages of 220, 440 and 550 and for 2 or 3 phase, 60-cycle current. A



FORBES & MYERS MODEL 102 BENCH GRINDER

special motor may be furnished when 60-cycle current is not available.

The grinding wheels are 10 x 1 in. and run at a speed of 1,800 r.p.m. Wheels of different grades of abrasive material and width can be supplied. The shaft runs on L-25 Norma ball bearings.

Brown & Sharpe 12-Inch Stainless Steel Rule

A 12-in. rule has recently been placed on the market by the Brown and Sharpe Manufacturing Co., Providence, R. I., which is made of the same stainless steel as the 6-in. pocket-size mechanic's rule described and illustrated on page 315 of the *American Machinist*.

The steel from which the rule is made is so hardened, tempered and ground as to bring out to the fullest the properties of resistance to staining, discoloring or rusting. The rule is graduated in eighths, sixteenths, thirty-seconds and sixty-fourths of an inch.

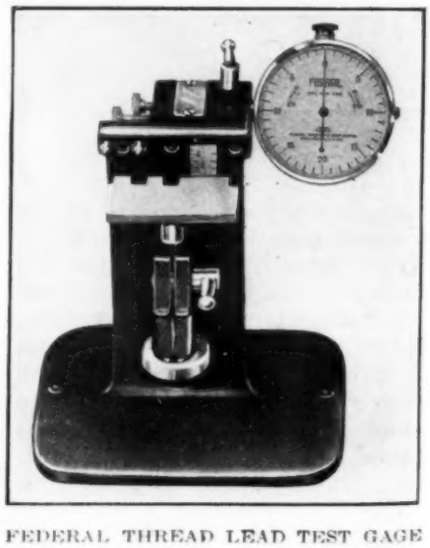
Federal Thread Lead Test Gage

A compact and sensitive instrument for testing the lead of screw threads has recently been put on the market by the Federal Products Corporation, 15 Elbow St., Providence, R. I., and is shown in the accompanying illustration.

An elevating platen or table is provided on the front of the column upon which to lay the work to be tested, and by means of which the axial center line of the work is brought in the same horizontal plane with the measuring points. A scale behind this platen enables the setting to be made instantly when the outside diameter of the work is known. The capacity of the tool covers any diameter up to 2 in., and pieces of any length may be tested.

The measuring point at the left is fixed, while the remaining point may be inserted in any one of the four holes in the bar to include lengths of ¼, ½, 1 and 2 in. between the threads to be tested. Measuring points can be furnished to suit any form of thread, or with ball points if desired.

To test a thread, a master is first laid on the platen in contact with the measuring points and the dial turned to bring the zero line under the pointer. Substituting a work piece for the master, the pointer instantly indicates the variation from true lead in half-thousandths inch plus or minus. Rapid work is thus possible.



FEDERAL THREAD LEAD TEST GAGE

News Section

Automotive Engineers Discuss Problems of Transportation at Meeting

THE FIRST national meeting of the Society of Automotive Engineers devoted to the subject of automotive transportation proved to be a great success, both in point of attendance and with regard to the material presented. It was held at the Winton Hotel in Cleveland on April 26 to 28, and attracted men from practically all branches of the manufacturing and operating ends of the commercial motor vehicle business.

The keynote of the meeting, as expressed at the principal sessions, seemed to be the need of co-operation between the automotive men and the managements of the older and better established transportation systems such as steam and electric lines. The operators of motorbus and truck fleets can learn much from the railway men, who, in turn, are learning many things from the innovations made by the former.

Co-ordination of the different systems of transportation so that each keeps in the field for which it is best fitted, is a necessary development. Although this problem has not yet been solved, a number of systems are being experimented with at the present time. The development of the terminal facilities to serve the different types of conveyors offers probably the greatest physical obstacle.

The sessions on Thursday, the opening day of the meeting, were devoted to the problems connected with the operation of motor trucks. S. Von Ammon, of the United States Bureau of Standards, gave the results of a study of the rear axles of motor trucks. The great possibilities of expansion and the need of organizing the truck operators were points brought out by S. G. Thompson of the White Co., when speaking on "What Is Right with the Motor Truck Industry?"

Terminal Facilities

The need of proper terminal facilities for co-ordinating rail and truck transportation was the theme of the paper "Successful Tractor and Semi-Trailer Railroad-Terminal Haulage," delivered by J. F. Murphy of the Columbia Terminals Co.

F. C. Horner, of the General Motors Corp., spoke on "English Cartage Practice a Standard for Our Railway Terminal Trucking." "The Retailer and the Engineer" was the subject of Harold B. Wess of R. H. Macy & Co. "Military and Commercial Highway Transport" was covered by Major Brainerd Taylor, of the Quartermaster Corps.

After the dinner on Thursday evening, the relation of the motor vehicle to the railroad was ably defined by Alfred H. Swayne, General Motors Corp., W. J. L. Banham, Associated Traffic Clubs of America, and Robert S. Binkerd, Committee on Public Relations of the Eastern Railroads.

C. D. Emmons, of the United Railways & Electric Co. of Baltimore, Md., occupied Friday morning's session with a paper on "The Co-ordination of the Motorbus and the Street Railway."

The taxicab session on Friday afternoon was addressed by Hugh G. Bersie, of the Haskelite Manufacturing Corp., who spoke on body construction; and by Mr. Croninger who read a paper by Paul H. Geyser, of the Yellow Cab Manufacturing Co., Chicago, on taxicab construction, maintenance and operation. At all sessions discussions were carried on at the conclusion of each paper, a factor adding greatly to the interest. On Saturday visits were arranged to a number of large manufacturing plants.

Editors Visit Plant of Westinghouse Co.

The editors of the McGraw-Hill Co. were the guests of the Westinghouse Electric & Manufacturing Co., at its East Pittsburgh plant on April 23 and 24. The publicity staff of the Westinghouse Co. was placed at the disposal of the editors and the entire plant was thrown open for their inspection. The two day visit was not confined to a general inspection trip, but the editors were permitted to arrange individual excursions and look up matters of interest to their respective industries.

Railroads Show Greater Activity

The Elgin, Joliet & Eastern R.R. has placed an order totaling $1,350,000 for 800 steel gondola and freight cars and fifteen locomotives.

Aug. 1 is the date set for the completion of the new yards of the Pennsylvania R.R. shops at Enola, Pa. The new shops will include a steel car repair shop and a riveting and cutting building. The new shops will employ from 500 to 600 men as compared to the 200 now employed.

The Santa Fe R.R. plans to spend sixty million dollars for additional equipment and track improvement. Enlargement of shops is included in the program.

Steel Corporation Makes Good Showing

The United States Steel Corp. recently issued its statement of earnings covering the first three months of the current year. The statement showed net earnings of $34,780,069, the largest reported for any quarter since the period of business depression which started in 1920. It is the first quarter in two years that the company has earned its common dividends with a wide margin, and the earnings of $14,691,647 reported for March were the largest of any month since November, 1920, when the earnings were $15,002,919. The statement on the whole, according to opinion expressed in the financial district, was as favorable as could be expected.

Foundrymen's Exhibit Is Well Attended

The twenty-seventh annual meeting of the American Foundrymen's Association, Inc., held at Cleveland, started most auspiciously on Saturday, April 28 by the exhibit of machines and appliances for foundry use. Both the arena floor and the exhibition hall of the new Public Auditorium were crowded to overflowing with a varied and interesting collection of foundry apparatus.

The presence of many large pieces of machinery is especially noteworthy; and in most cases machines are arranged to operate, a feature that adds greatly to the interest of the display.

The exhibition hall particularly, where the large machines were set up, with its seething activity and bedlam of noises arising from the equipment that is being developed to carry forward the standard of foundry practice, reflects the spirit of progress prevalent through the whole industry.

Beside the standard types of foundry equipment, there are many innovations. The scope of the exhibit is very broad, as allied fields such as welding are also represented. Manufacturers of grinding equipment, machine tools, trucks, conveyors, etc., are in evidence nearly as much as those of molding machines.

The exhibit lasts through May 3, at which time the technical sessions, which are being held at the Hollenden Hotel, also end. The opening session on Monday afternoon was devoted to aluminum and aluminum alloys. It was held jointly with the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, which association is now holding its Spring meeting. A steel foundry session was also held on Monday.

The sessions Tuesday were devoted to industrial education, non-ferrous foundry practice, sand research, general topics and business. Sand research, malleable iron and developments in the foundry industry occupied the association on Wednesday. On the closing day of the meeting the sessions are being devoted to steel foundry and gray-iron foundry practice.

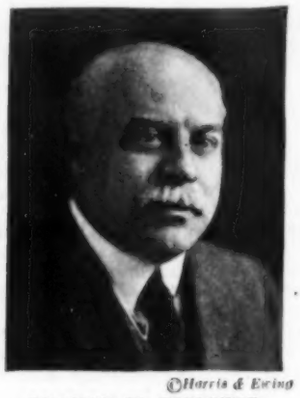
March Auto Output Breaks All Records

Automobile production increased in March and was the highest on record, exceeding by 64,006 cars and trucks the high production of last June, according to reports received by the Department of Commerce through the Bureau of the Census, in co-operation with the National Automobile Chamber of Commerce.

George K. Burgess Promoted to Director of Bureau of Standards

AT THE suggestion of Commerce Secretary Hoover, the President has appointed George K. Burgess to be director of the Bureau of Standards. Since 1913 he has been chief of the Bureau's Division of Metallurgy. His service with the Bureau dates from 1903, however.

The appointment of Mr. Burgess follows several months of futile search on the part of Secretary Hoover for an outstanding physicist, who had not been connected with the Government service, with sufficient means to allow him to make the sacrifice of income which would be entailed in the acceptance of



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GEORGE K. BURGESS

a Bureau directorship. Mr. Hoover's investigations revealed that physicists in the front rank of their profession are being paid salaries ranging from $18,000 to $20,000. He combed the country for a man possessing the requisite qualifications for this important Government post, but found no one of those who was acceptable to him who could be induced to take the place at the salary available.

While it was Mr. Hoover's desire to bring into Bureau a man from the outside who could be expected to have ideas and plans, prompted by his outside contacts, he recognized that the next best thing would be to promote some member of the Bureau's staff, who would have the advantage of an intimate knowledge with its work and problems. While his choice happened to fall on the ranking member of the Bureau's staff, Mr. Burgess' colleagues are unanimous in agreeing that he is best qualified to undertake the directorship.

Mr. Burgess was born in Newton, Mass., on Jan. 4, 1874. He received his B.S. degree from Massachusetts Institute of Technology in 1896. He held a fellowship at that Institution from 1898 to 1900. His Sc.D. was obtained in Paris in 1901. He served short terms as instructor at the University of Michigan and at the University of California.

Mr. Burgess served the Bureau of Standards from 1903 to 1905 as an associate physicist. From 1905 to 1913 he served as a physicist and in the latter year was raised to the rank of chief of division.

Mr. Burgess has been active in the work of the National Research Council. During the war, in addition to his regular duties, he was an advisor to the requirements division of the War Industries Board and to the Ordnance Department of the Army. In 1917 and 1918 he was chairman of the light alloys committee of the National Advisory Committee for Aeronautics. During the same period he was a member of the National Aircraft Standards Board. He was the recipient of a silver medal at the Pan American Exposition.

Most Indiana Industries Reported Busy

Demand for second hand machinery continues active in Indianapolis, according to dealers. With the exception of the demand from the coal industry, all other trades continue very satisfactorily. The coal demand is off and has been for some weeks now. Machinery dealers here say it is likely many of the operators will close their mines entirely for periods varying from two weeks to six sometime later in the Spring and make repairs which have been needed for some time. The entire winter has been such that coal operators never were so busy they could not make most of their repairs without closing their mines. Demand has been light and two days a week has been the average for work. However, there are many replacements, dealers here say, that will be imperative this summer.

Rail and electric carriers in Indiana have rather large repair programs contemplated with the coming of spring. The Pennsylvania railroad has a big program which includes repairs to much of the motive power. An active demand for machinery has been noted from the woodworking industries. From furniture to box factories there has been a good business. Interior finish mills and flooring factories are working to capacity and there are many expansions to be made this year in these lines.

Fabricating plants manufacturing construction steel have been doing some rather large buying of tools, as have the automotive industries. Both these industries seem to have orders ahead sufficient for most of the spring and into the summer months.

Officials of the Wood Turret Machinery Co., lathe manufacturers of Brazil, Ind., report only a fair demand, however. They say many industries are hesitant about investing in new machinery until it is determined just how serious is the present prosperity.

Three Good Speakers for Group Sessions

Arrangements for the group session of the Fabricated Production Department at the eleventh annual meeting of the Chamber of Commerce of the United States in New York, May 7-11, were completed during the week, three prominent speakers having accepted invitations to address the manufacturer delegates. The group meeting, preceded by a luncheon, will be held in the roof garden of the Waldorf Astoria hotel, Tuesday, May 8.

Robert S. Binherd, New York publicist, is the first speaker on the program, his subject being "The Effect of Freight Rates on Production and Manufacturing Costs." It is proposed to make the discussion of this phase of the program cover not alone the manufacturer's interest in the rates he must pay for his materials, but also bring out where the rate shoe pinches in distribution of his products.

The task of presenting a clear-cut picture of what establishment of quality standards in commodity production has brought about has been intrusted to Fred W. Kelley, president of the Portland Cement Association, Albany, N. Y. He will describe what has been done in many lines and also will report the judgment of those in these lines as to the effect upon their businesses.

The third speaker is Carl F. Dietz, president of the Bridgeport Brass Co., Bridgeport, Conn., whose subject will be "Employe Education in Fundamental Economics" with which he has had wide personal experience.

Iron and Steel Exports Show Gain

United States exports of iron and steel in February amounted to 135,182 long tons, an increase over the preceding month of 10,738 tons, according to the Iron and Steel Division of the Department of Commerce. Outstanding gains over January were: rails, 6,247 tons; steel bars, 2,837 tons; galvanized sheets, 2,780 tons; plates, 2,648 tons, and black steel sheets, 1,860 tons. The noticeable losses were: semi-finished steel products, 2,830 tons; structural shapes, plain material, 2,291 tons, and iron bars, 1,853 tons.

Carolina Metal Trades Holds Meeting

A meeting of the Carolina division of the Southern Metal Trade Association was held this month at Greensboro, N. C., with practically a 100 per cent attendance of the members of the association in North and South Carolina, according to William E. Dunn, Jr., of Atlanta, secretary.

A spirit of optimism was the prevailing keynote of the meeting, practically all of the foundry and machine shop operaters present stating that they are enjoying the best volume of business they have experienced in the past three years.

There has been an unusually large increase in export trade out of southeastern ports the past two or three months, principally to Latin-American countries, and considerable quantities of machinery, tools, supplies and other metal products are being taken by these markets. This business is the best it has been in some years.

W. S. Pfohl, of the Briggs-Shaffner Co., machinery manufacturers of Winston-Salem, N. C., and vice-president of the S.M.T.A. for that state, presided jointly at the meeting with T. H. Siddall, of the Sumter Machine Co., Sumter, S. C., vice-president for South Carolina. A feature of the meeting was the reading of a paper by J. M. Hollowell, treasurer of the S.M.T.A., on "Leaks and Kinks in the Foundry" that was thoroughly enjoyed.

Excellent Discussions Mark Welding Society Second Annual Meeting

EXCEPTIONAL interest was shown and much knowledge gained at the annual meeting of the American Welding Society that was held in the Engineering Societies Building, New York City, on April 24, 25, 26 and 27 and which was attended by many members from all parts of the country. Group meetings, committee meetings and general sessions were held in the mornings, afternoons and evenings of the four days of the convention.

On Tuesday morning there was a meeting of the committee on Training of Operators with J. C. Wright presiding as chairman. Discussions were enjoyed and opinions exchanged to the benefit of those attending. There was also a meeting of the Resistance Welding committee under the supervision of Herman Lemp, chairman.

The Electric Arc Welding committee with H. M. Hobart acting as chairman met in the afternoon and received several reports from subcommittees on standardization of arc welding apparatus, cast iron welding, application of arc welding to ship construction and other topics. There were also several new sub-committees appointed.

Evening sessions were held by the committee on Welding of Storage Tanks with J. C. Lincoln presiding as chairman. Reports of the progress that has been made in this line of work and of existing specifications were made.

On Wednesday morning the general business session of the entire society was held with the president's report for the year, reports from the finance committee, membership committee and the committee on meetings and papers, the report of the tellers on the election of officers and four short speeches by members on different phases of welding, the important features.

Barton Elected President

T. F. Barton, master mechanic of the Delaware, Lackawanna & Western R.R. was elected president to succeed C. A. McCune, sales engineer with the Page Steel & Wire Co., New York. A. V. Thompson of the General Electric Co., San Francisco, Calif., office, was elected first vice-president and C. L. Jones of the Atlanta, Ga., office of the Westinghouse Electric & Manufacturing Co., was elected second vice-president. The following were elected as directors of the society: C. A. Adams, professor of electrical engineering, Harvard University; H. F. Smith, Presto Lite Co., A. M. Candy, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and C. J. Holslag, of the Electric Arc Cutting & Welding Co., Newark, N. J.

On Wednesday afternoon a trip to the Third Ave. Railway System shops was enjoyed and the actual operations of various welding apparatus in a modern street railway shop were illustrated.

The annual dinner of the society was held at the Park Ave. hotel on Wednesday evening and in addition to several excellent speeches, other forms of entertainment were furnished and thoroughly appreciated by those attending the dinner.

Committee work took up most of the remaining days of the meeting and another inspection trip was arranged for Friday afternoon.

The annual meeting, which was the second in the history of the Society, was voted to be a big success from every angle and all of the members unhesitatingly stated that exceptional value was derived from the many discussions and talks that were so plentifully placed on the program.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.	$0.0326	$0.0322	$0.0236
Cold finished shafting.....	per lb.	0.0406	0.0406	0.032
Brass rods.....	per lb.	0.1913	0.1904	0.15
Solder (½ and ½)	per lb.	0.2987	0.314	0.21
Cotton waste..	per lb.	0.1231	0.1231	0.104
Washers, cast iron (⅛ in.)...	per 100 lb.	4.66	4.50	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0.592	0.575	0.608
Machine oil....	per gal.	0.349	0.349	0.40
Belting, leather, medium.....	off list	42%	42%	48½%
Machine bolts up to 1 x 30 in.	off list	44¼%	48⅝%	62½%

Engineers Discuss Plans For Exhibit

A preliminary meeting of the joint committee on a National Museum of Engineering and Industry was held at the Engineering Societies Building on April 25 to discuss possibilities and plans for forming such a museum and to arrange for an exhibit of engineering progress in the Fall.

Acting chairman H. F. J. Porter outlined the growth of the idea which is the outcome of the old Associated Veterans of the Delamater Iron Works and the Capt. John Ericsson Society of Swedish Engineers. These associations held a joint meeting in 1920 from which came the placing of the historical tablets on Ericsson house, the Phoenix Iron Works, the site of the Delamater Iron Works and the Continental Iron Works.

The Smithsonian Institute in Washington has undertaken the safe keeping of the Ericsson relics and now proposes to use them as a nucleus for a museum of historical engineering data. They will also assist in the exhibit planned by loaning numerous relics of historical interest to show the advance in engineering during the 19th century.

Details as to the date of the exhibit and its contents are to be announced later.

D. & H. Holds Centennial Celebration

The Delaware & Hudson Co. is the first railway in the United States to reach its centennial, which was celebrated on April 23 at Hotel Astor, New York, by a hundredth anniversary dinner attended by about 450 men from various parts of the country. Those at the speakers' table were: R. H. Aishton, James S. Alexander, Hon. Percival P. Baxter, W. G. Besler, Major General Robert L. Bullard, Nicholas Murray Butler, Hon. Royal S. Copeland, Seymour L. Cromwell, H. W. Dickinson, William S. Jenney, Otto H. Kahn, John B. Kerr, E. E. Loomis, Leonor F. Loree, Eugenius H. Outerbridge, E. J. Pearson, Samuel Rea, Jackson E. Reynolds, Right Rev. Herbert, D.D., A. H. Smith, F. D. Underwood, and Daniel Willard.

The main address of the evening was by President Leonor F. Loree, who outlined the history of the company, telling of its growth in a very interesting manner. He also stressed his oft expressed belief in less governmental regulation of the railroads and in giving the railway managers an opportunity to work out their own destiny in their own way. This was done in the usual, forceful manner which has made Mr. Loree such a prominent figure in the railway world.

James S. Alexander, president of the National Bank of Commerce, spoke on Banking and Transportation and H. W. Dickinson, honorary secretary of the Newcomen Society and assistant to the director of the Science Museum at South Kensington, London, spoke on the Use of Steam Power.

The souvenir program was historical, showing the early canal and the first locomotive in this country, the Stourbridge Lion as well as the early banking activities of the company. A novel feature of the dinner was a great birthday cake, depicting the history of the company and lighted by one hundred candles.

Buffalo Business Better Than Last Year

Although the month of April is not showing the heavy demand which the manufacturers of machinery in Buffalo were led to expect by the exceptional business done earlier in the year, nevertheless demand for boring mills, planers, gears and drills is much greater than for the same period last year. Especially heavy is the call for large size gears, reports the Farrell Foundry and Machine Co. of Buffalo. This company has increased its manufacturing facilities by adding 20 gear cutting machines and several boring mills within the last two weeks. It has also enlarged its tool room department and increased the number of its employees.

Electric drills are increasing in popularity and Buffalo distributors report a large volume of business in this line.

Chicago Settling Down to Normal Prosperity

Although inquiries for machinery and machine tools in the Chicago district have not been so numerous during the week, sales continue in fair volume. While no official statements have been made the general opinion is that there will be a still further advance in the price of machine tools as soon as the increase in the cost of steel is felt by manufacturers. The leading interests in the Chicago district have advanced steel to cover the eleven per cent wage increase of steel workers.

With the exception of railroads and the automobile industry who are enlarging and improving shop facilities, comparatively few machine tool purchases are the result of expansion. General manufacturing machine tool sales are mostly for replacement of worn out equipment. Consumers of machine tools, in fact industry as a whole, has heeded the advice of leading bankers and economic advisers and are cautious as to enlarging manufacturing facilities. The steady expansion of industry appears likely to continue throughout the greater part of 1923, according to the opinion of Chicago dealers, manufacturers agents and manufacturers. The most striking opinion to this effect in recent days was the report of the American Railway Association to the effect that the country's greatest industrial boom is likely to be at its height in October. American railroads are expending over a billion dollars on the strength of their faith in the industrial future.

Although wages have been materially increased in the metal trades industry and there is a marked shortage of skilled workers, production per man has not decreased.

A slight decrease in operations of leading steel mills was recorded during the last week, due principally to the shortage of labor. The steel plants are running at 92 to 93 per cent of capacity, against 95 per cent a week ago. Leading independent mills have reduced their output slightly. Prices were firm, but buyers were showing less of a disposition to pay premiums for early deliveries.

Capacity Output Is Reported From Philadelphia

Business in the machinery trade was reported unusually good from several sources in Philadelphia.

Virtually full forces have been at work in the textile trades, and in the industries where heavy machinery is manufactured similar reports were current. R. C. Ball, treasurer of the Philadelphia Gear Works, said the company has found it necessary to install new machinery to keep pace with the growing volume of business. The new equipment includes bevel gear generators, gear hobbing machines and other equipment.

A force of 18,000 men is employed by the Baldwin Locomotive Works in the producing of what Samuel M. Vauclain, president, said before starting on his present tour of the South and Southwest, would be the company's banner year.

The 18,000 is just below the Baldwin's capacity, and the maximum will be reached this summer, it was estimated by officials.

A similar condition exists at the plant of J. G. Brill & Co., car builders. James W. Rawle, second vice-president, said the plant at this time is operating seventy-five per cent full capacity, and within a month the full 100 per cent capacity will have been reached and later the indications are that 125 per cent will have been reached.

Orders for new cars come from many sections of the United States. The Philadelphia Rapid Transit Co. has an order for 550 new cars. Mr. Rawle said new woodworking machinery has recently been installed, including sanders, and planers, and some new drilling machines have been added to the equipment.

Much interest was shown here last week in the production of a new trackless trolley car for the Philadelphia company. The new vehicle represents a new method of transportation. A party of city and transit officials inspected one of the new cars this week. An order for several of them will be placed when the city grants a franchise for their operation.

Slow Improvement Shown In Cincinnati

The machine tool plants in Cincinnati are still showing a gradual improvement, although there has been somewhat of a slump in the number of orders during the past week to ten days. Conditions seem to be rather spotty, varying with the individual companies. Some report that they have noticed no falling off in the amount of business being placed, while others say that their orders have decreased materially during the last week. Buyers are demanding quick delivery in practically all instances, although it is impossible to fill orders in the short time designated by the buyer.

The demand for conveying machinery is brisk and is keeping the firms engaged in this business running on a heavy schedule. In fact orders are so good that they cannot be filled promptly, even though the buyer wants immediate delivery. The prices of materials involved in the manufacture of conveying machinery have been increasing, thereby lowering the margin of profit. The market price of conveying machinery has not gone up, however, although it is likely that it will if the demand continues and the material needed in their manufacture goes higher. Conditions are good and orders are being placed in satisfactory quantities for drilling machines.

Delivery of drilling machines is being made in about thirty days. The outlook for the future is rather uncertain. Local firms are making the most of the improvement which has come during the past few months, but are not in a position to prophesy about what the coming months will bring in the way of continued good business. Cincinnati manufacturers are hopeful that the stimulation in business will keep up and that production will increase steadily as it has during March and April.

More labor is being employed at present than at any time for months. The fact that machine tool houses are still taking on more men is a healthy sign and points to good production. The foundry business continues to show gradual improvement, but orders are usually connected with early delivery. Sheet metal plants are reported as busy, especially those turning out material going into the automobile trades.

Little new business has developed in the iron market. Consumers generally have contracted for their immediate needs and they show but little disposition to place orders very far in advance of their actual wants. Shipments are holding up well, however, because of the fact that foundries continue to be busy and there is an active demand for all kinds of finished materials.

Announce Speakers for Spring Meeting

The feature of the technical program of the Spring meeting of the A.S.M.E. to be held in Montreal May 28 to May 31, will be the session on Tuesday morning, May 29, on hydroelectric development. Julian C. Smith, vice-president and chief engineer of the Shawinigan Co., will tell of the power development in the Province of Quebec, and Fred A. Gaby, chief engineer of the Hydroelectric Power Commission of Ontario, will describe the development of hydro-electric power plants in Ontario. The two speakers are of outstanding importance in hydroelectric development work in Canada and their addresses will undoubtedly be of great interest. The second session on Power will have two papers. One is by H. G. Acres, hydraulic engineer of the Hydroelectric Power Commission of Ontario, who will present a paper on sectionalization and remote control of high-pressure steam lines. Mr. Dean's contribution will deal with the problems of controlling flow of steam in high-pressure lines.

Personals

E. PLANCHE, consulting engineer, has opened an office in Detroit, Mich. Mr. Planche has been an automotive designer and builder for many years both in the United States and abroad.

ROY Y. FERNER, representative of the Societe Genevoise d'Instruments de Physique of Geneva, Switzerland, received for the Societe the Edward Longstreth medal presented by the Franklin Institute for the invention of the Universal measuring machine.

WALTER GOODENOUGH has joined the staff of Dwight P. Robinson & Co., Inc., engineers and constructors, New York City.

E. W. BEELER has been appointed manager of the Columbus, Ohio, office of the United States Electrical Tool Co., Cincinnati, Ohio.

THOMAS H. CALEY has been appointed manager of the Minneapolis, Minn., office of the United States Electrical Tool Co., Cincinnati, Ohio.

W. M. MYERS has been appointed works manager for the Bucyrus Co., South Milwaukee, Wis. Mr. Myers has formerly been with the American Locomotive Co., the Baldwin Locomotive Works and the Lima Locomotive Works.

ALLEN B. COFFMAN has resigned as sales engineer for the Crouse-Hinds Co., to become manager of The Philadelphia District for the Reliance Electric & Engineering Co., Cleveland, Ohio, manufacturers of electrical motors.

MORRIS METCALF was elected treasurer of the American Bosch Magneto Corp., at the directors' meeting in New York on April 3, succeeding George A. McDonald, resigned.

HARRY B. JOYCE has been appointed manager of the synchronous motor department of the Ideal Electric & Manufacturing Co., Mansfield, Ohio. He is a graduate of Cornell University and before joining the Ideal Co. was affiliated with the United Railway & Electric Co., Baltimore, Md., and the United Electric Light & Power Co., New York.

H. H. PLEASANCE, for the past ten years connected with the sales department of the United Alloy Steel Corp. Canton, Ohio, the latter years as manager of sales, and H. C. THOMAS who has been in the operating department in an executive capacity have been elected vice-presidents of the organization.

EDWARD J. WALTZER has resigned as president and severed his connection with the Wetmore Reamer Co., Milwaukee, Wis., manufacturing reamers and other tools. Mr. Waltzer directed a reorganization of the corporation a year ago and became its president and general manager. He has associated himself with the Topp Oil & Supply Co., Milwaukee, jobber in petroleum products, paints, varnishes, etc.

EITARO WAGO, president of the Nitto Ice Mfg. Co., Tokyo, Japan, and S. ASANO, chief engineer of Takata & Co., Tokyo, arrived in Milwaukee on April 22 to visit the plant of the Vilter Mfg. Co., one of the principal manufacturers of ice and refrigeration machinery in this country. The visitors are making an extended tour of the United States to observe modern conditions and developments in ice machinery. The Nitto Co. controls 122 ice producer plants supplying 80 per cent of the trade in Japan.

Business Items

The Turner Mfg. Co., Port Washington, Wis., manufacturing tractors, gas engines, farm and garden tools, etc., has filed a voluntary petition in bankruptcy at Milwaukee, scheduling liabilities at $236,550.87 and assets at $363,768.42. Unsecured claims amount to $206,008 and consist largely of debts due on notes. Assets include: Real estate and buildings, $77,119; stock in trade, $123,776; machinery, tools, etc., $135,590; notes, $7,652. W. J. Niederkorn, secretary, signed the petition. Weldemar C. Wehe, 425 East Water St., Milwaukee, is attorney.

The so-called Tucker bill, providing for a compulsory eight-hour day in mills, factories and other industrial establishments in Wisconsin, with farmers alone exempted, was killed by the State Senate after passage by the State Assembly. A motion for reconsideration was defeated, so that it is now deemed certain that no legislation of this kind can be attempted further at the present biennial session of the Wisconsin Legislature.

The entire assets of the Perfex Radiator Co., Racine, Wis., manufacturing automobile, truck and tractor cooling systems, were bid in for $125,000 at public auction conducted by Willis E. Keats, receiver at Milwaukee, by E. M. Alexander, attorney, Milwaukee, who was represented to be acting in behalf of a group of Milwaukee and Racine capitalists, headed by Fred Young, who has been serving as manager of the concern during the receivership. Contracts for radiators amounting to more than $85,000 are on the books of the company. Inventories filed upon the petition in bankruptcy gave the value of the assets at $334,000, including $100,000 in patents, $96,000 in real estate, buildings and machinery, and $36,500 in merchandise. The corporation has an authorized capital of $1,000,000.

H. H. Timken was re-elected president of the Timken Roller Bearing Co., Canton, Ohio, at the annual meeting of the board of directors which followed the meeting of the stockholders. W. R. Timken was re-elected vice-president; Herman Ely, vice-president-treasurer; J. G. Obermeier, vice-president in charge of production, and J. F. Strough, secretary. The five officers constitute the board of directors elected by the stockholders.

In connection with the National Canners Association convention to be held in Buffalo in January next year, the Canning Machinery and Supplies Association will exhibit machinery. As one building will not be sufficient for both exhibits it is planned to hold the National Canners Association exhibit at the Elmwood Music Hall and the Canning Machinery and Supplies exhibit at the Broadway Auditorium.

Expansion of the Great Northern Terminals at St. Cloud, Minn., at a cost of approximately a half million dollars is planned this summer. The work includes a new roundhouse, a machine shop, a powerhouse and other facilities essential to a complete operating terminal. Division headquarters will be moved from Melrose to St. Cloud. Ten miles of trackage will be constructed.

A new machine shop under the name of Howell & Sherburne has been established in Pasadena, Calif. Both members of the firm were formerly with the Mt. Wilson Observatory.

The Oilgear Co., Milwaukee, Wis., has appointed the Buffalo Machinery Sales Corp., Buffalo, N. Y., its sales representative in western New York.

The Creditors' Protective Committee has purchased from the receiver the plant, equipment and business of the Rivett Lathe and Grinder Co., Boston, Mass. The committee will reorganize the company under the name of the Rivett Lathe and Grinder Corp. and with added capital will plan expansion. T. S. Ross is president and general manager of the new corporation.

The Arabol Manufacturing Co. is now located at 110 East 42nd St., New York City.

The Skinner Chuck Co., New Britain, Conn., has bought from the Production Tool Equipment Co., of Bridgeport, Conn., all of the dies, patterns, fixtures and machinery for the production of the Ketchum vise. It is planned to develop a complete line of milling machine vises.

The Naval Department has announced that it will receive sealed bids up until 11 a.m. May 15 on a variety of yachts and vessels now at various ports in the Atlantic. Some of the vessels have been used as targets, while others are in first-class condition.

The Buffalo sales branch of the American Steel and Wire Co. will move to 670 Ellicott Street, Buffalo. The new location is better situated and affords twice as much floor space as the former.

According to a recent announcement by C. G. Wilkinson, of Savannah, Ga., for many years prominently identified with the machinery manufacturing industry in the Southeast, the Wilkinson Machine Co., of Savannah, has been entirely reorganized and the name of the company changed to the Wilkinson Machine Works. Mr. Wilkinson is president, and J. H. Craggs, Jr., general manager of the plant. Improvements and enlargements are planned.

The main plant of the Hill-Griffith Foundry Co., Cincinnati, was destroyed by fire with a loss of $150,000. This concern manufactures foundry facings and supplies and also polishers' supplies. The main four-story brick building will be rebuilt, according to Albert Witte, treasurer of the company.

Obituary

FLOYD CHARLES FURLOW, president of the Otis Elevator Co., died April 26 at the Ritz-Carlton Hotel, New York City, after an illness of six weeks. He was 46 years old and had been connected with the Otis Co. for eighteen years. He was made president five years ago. Mr. Furlow had been in Florida during the Winter trying to recuperate. His health had been failing for some time.

He was educated at Georgia Institute of Technology. He continued his engineering studies at Worcester Polytechnical Institute and abroad in metallurgy and kindred sciences.

For several years he pursued the profession of consulting engineer at Atlanta and at the same time was a lecturer in experimental engineering at Georgia Tech. In 1902 he was made chief engineer of the Plunger Elevator Co. of Worcester, Mass., and two years later became vice-president of that company.

Mr. Furlow became chief engineer for the Otis Elevator Co. in 1905 and soon after was made vice-president and then president. Mr. Furlow, in spite of his business activity, maintained his interest in metallurgy. He has done much research work in electrical, hydraulic, and steam engineering and machine design. He was one of the first experimenters in X-ray photography in America and as engineer he built the first wireless apparatus in the South.

JOHN GILBERT WARD, aged 68 years, died recently at his home in Glen Ridge, N. J. Mr. Ward had been the treasurer of the Babcock & Wilcox Co., New York, for thirty years.

M. C. TOWNLEY, president of the Walcott Lathe Co., Jackson, Mich., died recently at his home in that city.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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IN 1893 THERE was an eighteen-hour train between New York and Chicago, but it was abandoned after it had been run a while, and twenty hours is now the shortest time in which the journey can be made. In about the same year many railroads made speed records that have never since been equalled or attempted.

Railroad men have learned that these high speeds are both destructive and dangerous. The fast trains were popular and travel on them was exciting, but they tore up the road bed and so increased the hazards of operation that many accidents occurred. Now the slogan is "safety first" and speed is subordinated to security and comfort.

There has been an analogous change in the spirit and policy of American business. Not so long ago the conditions that now exist would have engendered wild speculation and what used to be called a boom, but we have learned by experience that high speed generally results in a smash up, and in the East as well as in the West the brakes are now being applied whenever the train of business seems to be moving too rapidly.

The executive council of the American Bankers' Association, for instance, "looks with concern on the strong upward swing of wages and prices" and warns against overconfidence. Henry Ford, who perhaps is most influential of all, says that unless business men come to their senses and quit the mad scramble for material, he is not sure we can retain our present prosperity. Trade associations are trying to hold down the placing of duplicate contracts and the credit men's organizations are urging their members to watch the inventories of both their own firms and their customers and to prevent the accumulation of excessive stocks.

These are useful warnings and they are being heeded. The conservatism which they engender inspires confidence, and as long as it persists we may expect a moderate prosperity that will confound the expositors of the cycle theory.

The markets of the week justify this prognosis. The stock market in particular seems to be on an even keel again and, though the bears have tried to rock the boat, it has been steadied by the buying of those who discerned that much of the recent selling has been for "short" account. The speculative short interest is now probably larger than for some time and as the unfavorable factors known and predicted are fairly well discounted a recovery on good news is to be expected.

The same thing may be said of the commodity markets in so far as the Government's sugar suit is concerned. As an attempt at price regulation by injunction it seems likely to prove a boomerang, for it has only advertised the shortage in sugar first discovered and announced by the Department of Commerce, with the result that many housewives who don't know what an injunction means are buying more sugar than they need for immediate use.

In the other commodity markets the advancing tendency which was nearly universal a few weeks ago has given way to more uncertain movements. Iron and steel products are not being ordered so feverishly and the flush is off the markets, while copper has slumped sharply. Rubber and coffee, which have dropped considerably below last winter's prices, refuse to recover. The oil markets have at last succumbed to the effects of the enormous production in which California is leading and both crude oil and gasoline are weak. Silk, hides and leather are not changing much.

> "Industrial production continues well up to the limits imposed by the shortage of labor and no serious slackening is looked for. Conversely, no further expansion seems probable, for it is hardly to be expected that labor can be made to work more efficiently when jobs are easy to get . . . . on the whole, it is evident that affairs abroad are not turning as badly as some of the pessimistic prophets expected. The outlook for better times in Europe seems improved."

Among the commodities of most direct interest to the pocketbook, wool is one of the strongest. Its unrestrained price advance during the past two years has been so well advertised that consumers have had an unusual opportunity to anticipate an increase in the price of clothing by purchasing early. But they apparently have not done so, and in other markets as well the advice to "buy only according to needs" seems to have been widely followed. Retailers have pursued the same policy and their stocks are everywhere reported low. Continued steady buying therefore seems probable and on this theory some cloth converters and garment manufacturers have covered or soon expect to cover their requirements for material for some time ahead.

Industrial production continues well up to the limits imposed by the shortage of labor and no serious slackening is looked for. Conversely, no further expansion seems probable, for it is hardly to be expected that labor can be made to work more efficiently when jobs are so easy to get. Meanwhile the possible effect of the labor scarcity on the production of our food crops is beginning to attract attention as the following quotation from a Western farm journal will show:

"Wage scales in industry are now back to practically the 1920 level. This means that labor cost for farm products this year will be on the 1920 basis. If we were sure of a price level as high as that which prevailed for the 1920 crops, this fact would not be disquieting. But we do not see anything at this time on which to base expectations that this will be the case. It will take crop failures somewhere to give us 1920 prices.

"What is the answer? It seems perfectly clear that hired help cannot make the farmer any money this year. In fact, in most cases they will probably cost more than they are worth. If a farmer wants to farm imply to support hired men then he can employ them, but not otherwise.

"As we see it, the present immigration law hits the farmer both ways, increases his cost and decreases his market."

The outlook for better times in Europe seems improved. French bonds have advanced sharply and a growing belief is discernible, following President Harding's speech in New York last week, that the United States will soon take a hand in straightening out Europe. Nearer home the recognition of Mexico is again being agitated and on the whole it is evident that affairs abroad are not turning out as badly as some of the more pessimistic prophets expected.

Possibly their predictions served a purpose, however, in restraining optimism which otherwise might have been unbridled. It has, perhaps, kept purchases within the limits of production and deterred sellers from unduly marking up prices. If this conservatism continues the keynote we shall have a good though not an abnormal business throughout the summer.

Will Again Revise Wages at Navy Yards

Reports from various navy yards have convinced the department that the recent changes in the wages of certain trades in private industrial establishments in various localities render it advisable that the wage schedules just promulgated which become effective May 1 be revised. Wage boards will, therefore, be convened at the various yards to collect new data and recommend a revised scale which will go into effect July 1 and continue until the first of the year. Pending revision of the wage scale effective May 1, no reductions will be made from the scale effective Sept. 16, 1921. The proceedings of of wage boards will be under the new regulations.

The recent revision raised the pay of workmen in some instances, lowered it in others and in several cases no changes were made. The new wage scale is expected shortly.

Industrial Results of the Ruhr Occupancy

Less production of both coal and iron and consequently fewer wheels moving in the occupied zone—Germany's coal reserve and her resistance—Possible results

BY OUR BERLIN CORRESPONDENT

SUFFICIENT time has now elapsed since the occupation of the Ruhr to expose it as the most bitter economic warfare, known to history. It may perhaps be termed the belated but final battle of the war. Germany is throwing all her strength and a large part of her remaining substance into it, in a spirit, reminiscent of war times. The German policy of resistance is prompted by the deep conviction that her whole economic independence is at stake, that the real objective of the occupation is much deeper and far-reaching than its proclaimed aim portends.

The German standpoint sees in the occupation apart from political issues a deeply laid plot for French industrial supremacy prompted by the economic forces inherent in the largely grown French iron interests driving towards conjunction with German coal. A few figures and arguments may be quoted from German essays supporting this theory, which are illustrative of the situation.

Of Europe's iron deposits France owned before the war 35 per cent, Germany 25¼ per cent. By the territorial changes of the peace, France's share rose to 53 per cent and Germany's dropped to 7¼ per cent. Germany's output of iron ore was in 1913 more than twenty-eight million tons or 26.7 per cent of the European total. The output of France was more than twenty-one million tons or 20 per cent.

French Inactivity at Mines

Measured at the rate of production in 1913, the developed mining capacity of France's present iron ore deposits is forty-three million tons or 40 per cent of the European total, and that of Germany seven million tons or 7 per cent. While Germany is again exploiting this capacity to almost 100 per cent, the output of France has not nearly reached even the pre-war standard. In 1921 it was only fourteen million tons as against twenty-one million tons in 1913. France is, therefore, exploiting hardly more than a third of her developed mining capacity. This brings into relief the fact that the French iron resources have grown quite out of proportion to the country's coal resources.

Germany still owns 33 per cent of Europe's coal reserves, while France's share is only 2.3 per cent or with the Sarre basin 4.4 per cent. Germany has in this respect still the leading position in Europe, further strengthened by her large brown coal deposits.

The temporary possession of the Sarre district secures for France an additional quantity of eleven million tons annually and the German coal tribute fifteen million tons. Both will, however, come to an end one day. That of the German coal tribute is not very far away.

Germany on the other hand has maintained a large part of her iron production by import of ore, whereby it has to be remembered that, even in pre-war times, a large portion of German iron was produced from foreign ore. In 1913 55 per cent of the iron ore consumed in the Ruhr came from abroad. About fourteen per cent was supplied by Lorraine and Luxemburg. Germany can still procure supplies from this source, but she is not dependent on them. On the other hand the dependency of French iron on German coal is obvious. France has no other alternative than either to reduce the output of iron ore or to ship the surplus to the German blast furnaces.

In possession or in control of Ruhr and Rhineland conditions would be entirely reversed. Taking into consideration the vastly extended spheres of French influence over Poland and Czechoslovakia and the interests controlled there already privately, France would then indeed attain to a position of industrial supremacy in Europe, fairly dwarfing even the British position. This is the economic back ground upon which the drama of the Ruhr occupation is enacted. The spirit of self-defence in fear of annihilation is the main prop of the German resistance. Practically it rests upon props of a different nature, now clearly exposed by the experience of the first three months of the occupation.

> "Since the end of January the German interior has received not one ton of coal or coke from the Ruhr with the exception of the few mines in the Hamm and Ahlen districts. Still no actual stringency has taken place and none is within sight. According to reliable information, the larger part of industrial consumers is still provided with coal for several months ahead."

Germany's Preparedness

Obviously the Ruhr occupation has not met the German government quite unawares, but has been prepared against beforehand, as a danger impending for nearly two years. The possibilities of a resistance have evidently been mapped out most carefully. It is even not out of the question that large stores of coal have been accumulated in the interior, towards the event, as the coal situation three months after the blockade seems to indicate.

Since the end of January the German interior has received not one ton of coal or coke from the Ruhr with the exception of the few mines in the Hamm and Ahlen districts, left outside the occupied region. The imports are keeping at a level with the last months of the previous years. All efforts to increase the output in the remaining fields have failed. Still no actual stringency has taken place and none is within sight. According to reliable information the larger part of industrial consumers is still provided with coal for several months ahead. Without large reserves—much larger ones than official statements proclaimed—such state of affairs would have been impossible.

The line of resistance is chiefly based upon the policy to keep production going as far as possible, providing full employment for the workmen and for the rest rely upon the intricacy of mechanical equipment, made useless by quick manipulations, to raise a formidable barrier between the invader's intentions and their execution.

The Transportation Enigma

The transportation problem alone is considered of sufficient precariousness to block the way of the occupying force. The Ruhr district has the most dense and most elaborate railroad system in Europe. All junctions in the heart of the district are controlled electrically from one central station. Modern automatic signal and controlling devices are employed throughout which, when in working order, constitute great facilities. Out of gear they become a deadweight. The absence of auxiliary equipment compels the invader to resort to the crudest make-shift methods. Similar conditions prevail with regard to the hoisting and conveying machinery. Essential parts are removed if seizure threatens and hidden in the pits. Repair is out of question without close acquaintance with the design and without capacious repair shops.

So far, the measures of resistance taken have been very effective. The occupying force has restricted its energy to putting one railroad line across the northern part of the district in commission. Loading operations are still performed in the most primitive fashion by shovels, baskets and wheelbarrows. The road to success is slow and extremely difficult. Only a fraction of the quantity shipped to France and Belgium prior to the occupation can be removed now from the vast stocks of coal and coke accumulated at pitheads and every nearby space. That the full previous supply or even a considerable part of it can ever be removed against this resistance seems, from a three months' experience, quite out of the question. The German government has evidently secured there the first trick and is still holding some master cards in its hand.

Not so fortunate was it in its other measures. It was largely prompted by the determination to humor the working classes. It was chiefly directed against the capitalistic classes and, as a result, did not fortify the industry's power of resistance, but rather tended to undermine it. The government's swoop upon the hoarders of foreign money, forced to sell by the sudden rise of the mark rate in conjunction with a severe curtailing of credit, deprived producers and dealers of a large part of their financial reserves.

Still, the intended lowering of the price level is slow in coming. In one important point the official strategy has failed entirely particularly in the mat-

ter of living cost| The improvement of the mark rate has not succeeded even to arrest its upward move, only checking it. This fact, together with the pressure exercised upon the wage level, is creating a gradually rising tension in the labor situation.

Manufacturers yielding to this tension, and faced on the other side by a rapidly declining market, are placed in an awkward position moreover. Export has become entirely unprofitable. Dissatisfaction reigns equally with employers and employees. The growing of the business depression is largely precipitated by the conditions in the occupied zones. Here disaster is approaching at a most perilous speed. The isolation of these parts from the outside world is almost complete. Every ordinance of the occupying force calls forth a conflicting one from the other side. Between the two, the business world is condemned to inaction. The levy of import duties in the occupied zones, which the German government forbids its subject to pay, the fact that German export and import permits are not recognized by the allied authorities whereas German subjects are not allowed to obtain such from the latter have most effectively brought merchandise traffic to a standstill.

Were it not for the splendid organization of the German industry, resembling almost that of a military force in lay-out and discipline, matters would have taken a most serious course. Besides the financial strain caused by all these adverse conditions is becoming quite intolerable.

The inflation is increasing in leaps and bounds. The deficit in the state's budget has since April 1, 1922, accumulated to 7,000,000 million marks. Imports are growing, spurred by the high level of domestic prices, and exports are rapidly declining. From 1,760,000 tons in December they have dropped in January to 1,300,000 tons and in February, according to preliminary reports, to 1,000,000 tons. The strength exhibited on the German side is largely artificial and cannot conceal to the close observer the ravages wrought upon the country. It is quite clear that no matter how the Ruhr drama ends, Germany will emerge from it in a greatly weakened state.

Predict Big Motor Year in South Africa

The year 1923 promises to be a banner period for the automotive business in South Africa, says *Commerce Reports*, published by the United States Department of Commerce. In spite of the general depression during 1922, there was a steady increase in demand for motor vehicles of all kinds. Stocks of cars held in bond, which have so hampered the import trade since 1920, have practically disappeared, the 270 still located at the principal centers at the end of 1922 representing current stocks which will be cleared and replaced as new models come in.

This improvement has been variously attributed to the slight betterment in general business conditions, to the greatly improved local service facilities, and, most of all, to the reduced prices of American cars.

While the total number of cars imported during 1922 was more than double the number in 1921, the value was only about one-third greater. Since American cars, manufactured in the United States and Canada, comprise over 90 per cent of all cars brought into South Africa, this shift in ratio of values to numbers reflects chiefly the results of lowered prices for the American output as compared with 1921 prices.

The most gratifying feature about the comparatively heavy shipments received in the last quarter of the year is the fact that they were sold shortly after arrival. The unusually large number imported during November and December—546 and 538, respectively—in each case more than quadrupled the 137 received in February. Shipments received in the period, January-May, ranged between 137 and 387; in the period June-October, between 441 and 490.

Trade Catalogs

Gear Cutting Machines. The Fellows Gear Shaper Co., Springfield, Vt. A particularly attractive booklet, now in its second edition, has been issued by this company. The booklet tells of a new type of gear shaper that is made by the Fellows Gear Shaper Co. and the text is divided into chapters much the same as any book. The illustrations are numerous and well arranged and the descriptive matter is exceptionally well written.

Milling Machines. The Ingersoll Milling Machine Co., Rockford, Ill. Eight of the milling machines made by this company are shown and briefly described in a four page folder that has recently been issued by the company. The Ingersoll type "R" inserted tooth milling machine is also described at some length with a "close-up" view of the teeth.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Standard and narrow-gage locomotives, narrow-gage passenger and freight cars, and narrow-gage rails and accessories. Poland. Quotations, c.i.f. Danzig. Payment in United States currency. Reference No. 6099.

Machinery for the planting, cultivating and harvesting of cotton. Australia. Sole agency. Reference No. 6117.

Transmission belts of balata and leather and rubberized canvas hose. Poland. Purchase and agency. Quotations, c.i.f. Danzig. Correspondence, Polish or German. Reference No. 6119.

Motor cars, trucks, motor cycles and automobile wheels. India. Agency. Quotations c.i.f. Indian port. Reference No. 6124.

Automobile screws and valves, accessories and supplies. Norway. Agency. Reference No. 6125.

Oil engines, gas-suction engines, flour mills, pumping machinery, oil and hydraulic presses, pipes of all kinds steel wire rope, and artesian boring tools. Palestine. Purchase and agency. Reference No. 6129.

Machines for the manufacture of buttons from mother-of-pearl. Australia. Purchase and agency. Quotations, c.i.f. New South Wales and New Guinea. Reference No. 6130.

Woodworking machinery. Rio de Janeiro, Brazil. Purchase. Catalogs and full information desired. Reference No. 6131.

Transmission belts and motors for driving purposes and high-speed tool steel and sheet steel. Poland. Agency. Quotations c.i.f. Danzig. Correspondence Polish or German. Reference No. 6132.

Woodworking and metal-working machinery. Poland. Agency. Quotations, c.i.f. Danzig. Payment in United States currency. Reference No. 6134.

Printing machinery. South Africa. Manufacturers' agency. Quotations, f.o.b. American port. Payment to be arranged through firm in New York. Reference No. 6135.

Crushing and pulverizing plant for the manufacture of lime of a capacity of from two to five tons a day. Costa Rica. Purchase. Quotations, c.i.f. Puntarenas or Limon. Terms, payment against documents. Reference No. 6136.

Supplies for engineering and mechanical and kindred industries, such as grinding machines and machine tools. South Africa. Exclusive agency. Quotations, f.o.b. American ports. Terms, payment against documents. Reference No. 6149.

Machinery for loading wagons with sand and stone, also three ton derrick which can be loaded on auto truck. Argentina. Purchase. Quotations, f.o.b. place of shipment. Terms, Cash. Catalogs and prices desired. Reference No. 6174.

Names and addresses of the following merchants will be forwarded upon request to the Philadelphia Commercial Museum, 34th below Spruce Street, Philadelphia, Pa. Requests should be made by number.

Tool steel, gin, mill and railway stores, machinery, engineering goods, pipe fittings and pressure, hydraulic and steam gages. India. Agency. Correspondence in English. Reference No. 40,567.

Mixing machines for bakers. Sweden. Correspondence in English. Reference No. 40,602.

Button hole-making machines. Virgin Islands. Correspondence in English. Reference No. 40,605.

Small circular saw, small hand machinery for straightening, polishing and trimming canes and rattans to be made into walking sticks, machinery for curving handles. Dutch East India. Correspondence in English. Reference No. 40,609.

Hand machine for making sealed tins for jam. British East Africa. Correspondence in English. Reference No. 40,617.

Machinery for grating cocanuts. Venezuela. Correspondence in Spanish. Reference No. 40,620.

Machines for pumping water from a depth of twenty-four feet. Mexico. Correspondence in Spanish. Reference No. 40,621.

Steel split pulleys. India. Correspondence in English. Reference No. 40,655.

Forthcoming Meetings

American Electro Chemical Society. Semi-annual meeting. Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Chamber of Commerce. Annual meeting, New York City, May 7 to 10. Julius Barnes, president.

American Association of Engineers. Annual convention, Norfolk, Va., May 7 to 9. C. E. Drayer, 63 East Adams St., Chicago, Ill., secretary.

National Association of Manufacturers. Annual convention, Waldorf-Astoria Hotel, New York City, May 14-15-16. General offices, 50 Church St., New York City.

National Association of Purchasing Agents. Annual convention, Cleveland, May 15 to 18. H. R. Heydon, 19 Park Place, New York City, secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

New and Enlarged Shops

Machine Tools Wanted

Calif., Los Angeles—Wilhite Machine Wks., 1245 South Hope St.—single automatic, also 4 spindle automatic screw machines.

Fla., Orlando—Orlando Mfg. Co., P. O. Box 1256—complete equipment for machine shop, including lathes, drill presses, planers, millers, etc.

Ga., Milltown—J. K. Exum—drilling and wood boring machines, also punches and shears, light variety, for proposed plant for the manufacture of road building vehicles.

Ia., Garden Grove—C. H. Light—drill, press, forge, welders and other machine shop equipment; cement block making machinery.

Kan., Wichita—Eyestone Garage, 411 East 21st. St., O. Eyestone, Purch. Agt.—drill press, belting, hangers, emery stand, pulleys and shafting.

Kan., Wichita—Industrial Electric Co., 1858 North Lawrence St., L. D. Crain, Purch. Agt.—power lathe and drill press.

Kan., Wichita—McCorkle & Collins, 926 East Harry St.—power lathe.

Kan., Wichita—C. Stockard, 1001 East 9th St. (machine shop)—power lathe.

Kan., Wichita—Wichita Piston Co., 631 North Main St.—power drill press and lathe (used).

Ky., LaGrange—Southern Signals Co.—machinery and equipment for new $60,000 factory for the manufacture of railway signals.

Md., Baltimore—E. A. Kaestner, 516-518 North Calvert St.—complete machine shop equipment, including lathes, drills, presses, etc., for the manufacture of metal equipment for dairies, etc. (new).

Mass., Boston—Boston Elevated Ry., 108 Massachusetts Ave., E. Dana, Genl. Mgr.—machinery for proposed $500,000 shops at Everett.

Mass., Boston—L. D. Greene, 659 Columbia Rd. (garage and machine shop)—drills, reamers, benches, punch, vise, air compressor, belting and shafting.

Mass., Boston—S. Shwartz and M. Peraner, 8 Harvard St.—automobile repair and machine shop tools and equipment, including grinders, drills, reamers, shafting, belting and small tools.

Mass., Lowell—Saco Lowell Shops, Dutton St.—equipment for proposed $500,000 machine shop.

Mich., Detroit—Amer. Nut Co., 676 West Grand Blvd.—screw machine and nut making equipment.

Mich., Iron Mountain — J. Lawrence (garage)—small drill press, emery grinders, gasoline storage tank and pump.

N. Y., Buffalo—E. H. Close, c/o E. B. Green & Sons, 75 Niagara St.—equipment, also one 1,000 gal. gasoline tank and pump for proposed small factory for automobile battery repairs at 740 Main St.

N. Y., Buffalo—G. R. Gilderhouse, 59 Trinity Pl.—equipment, also two 5,000 gal. gasoline tanks and pumps for proposed service station on Bway and Curtiss St.

N. Y., Buffalo—J. Waechter, 83 Richlawn Ave.—equipment, also one 1,000 gal. gasoline tank and pump for proposed automobile service station on Ontario St. and Ross Ave.

N. Y., Elmira — Elmira, Corning & Waverly Ry. Co., 400 East Water St.—car repair and machine shop machinery and equipment.

N. Y., Jamestown — Jamestown Metal Desk Co., Blackstone Ave., E. Jones, Mgr.—welders, presses, shears, etc., for proposed addition to plant.

N. Y., Jamestown—C. A. Nelson, Fluvanna Rd.—garage and repair shop machinery, tools and equipment.

N. C., Wilmington—Atlantic Coast Line Ry., A. C. L. Bldg., F. H. Fechtig, Purch. Agt.—machinery for proposed shops at Montgomery, Ala.

O., Columbus—Columbus Ignition Co., 118 East Spring St. (automobile repairing), R. B. Gargett, Mgr.—testing rack and probably grinder, ordinary size.

O., Columbus—Packard-Columbus Motor Co., Grant and Broad Sts., H. Fuller, Service Mgr.—equipment for service station, including grinder and milling machine.

O., Columbus—Union Fork & Hoe Co., 500 Dublin Ave. (manufacturer of garden tools), T. F. Connors, Secy.—milling and riveting machines.

O., Springfield—Mitreu Metal Products Co., O. S. Mitchell, Mgr.—metal working equipment, including slotting and shearing machines, also tinsmiths machinery.

Pa., Monongahela—Liggett Spring & Axle Co., S. C. Liggett, Purch. Agt.—machine tools to re-equip plant.

Pa., Phila.—T. H. Dallet Co., 1324 Federal St. (manufacturer of machinery)—boring machines, lathes, planers, drill press, etc., for new plant.

Pa., Phila.—Penn Metal Wks., 317 North 6th St.—double section large punch, 16 in. drawing, 8 in. cutting stroke, Bliss-Toggle preferred.

Pa., Phila.—Pennsylvania R.R., 17th and Filbert Sts., R. M. Smith, Purch. Agt.—42 in. vertical punch and 48 in. planer.

Pa., Scranton—J. Notarinna & P. Battista, 1100 Block Wyoming Ave.—complete garage and repair shop equipment, including drills, lathe, press, boring in machine, air compressor, etc.

Pa., Scranton — H. Wissocker, North Main Ave.—garage and repair shop equipment, including lathe, press, drill, air compressor, etc.

Pa., Wilkes-Barre—P. J. Schmidt, Controller, Court House—receiving bids May 18 for complete equipment for county machine shop.

Tex., Dallas—Perfection Mchy., Tool & Die Co., 2312-2314 Harrison St., N. P. Long, Purch. Agt.—one 18 in. lathe, Universal milling machine, also vertical and slotting attachments.

Tex., Wichita Falls—J. Marshall, 501 8th St. (machine shop)—cylinder and piston grinders.

Va., Norfolk—Taylor-Parker Co., Water St. and Commerce Pl.—complete machine shop equipment, including lathes, etc. (used); four side wood planer, not less than 14 in. wide, 6 in. opening, larger preferred.

Va., Richmond—Hackley Morrison Co., Inc., 1708-1722 Lewis St. (machinery dealers)—engine lathe with swing 18 in. over ways, to take 6 ft. 10 in. between centers.

Wis., Delevan—W. M. McCommous—automobile repair machinery, press, gasoline storage tanks and pumps for proposed $40,000 garage.

Wis., Green Bay—A. Libert Machine Co., 324 Roosevelt St.—equipment for proposed machine shop, including drill presses, grinders and air compressor.

Wis., Madison—J. Petersen, 102 South Orchard St.—automobile repair machinery and small tools for proposed $40,000 garage and repair shop.

Wis., Oshkosh—R. J. Teela, 346 Main St.—shop equipment and small tools for sheet metal shop.

Wis., Phillips—F. Mayer—automobile repair machinery, including drill press and small tools, also gasoline storage tanks and pumps for proposed garage.

Ont., Toronto—Bd. Educ. 155 College St., W. W. Pearse, Business Administrator—receiving bids until May 7 for equipment, including wood and machine lathes; drills; grinders; machine shop equipment, including tools; printing shop equipment.

Ont., Windsor—Universal Garage, Chatham St.—complete equipment for proposed $40,000 addition to garage.

Que., Montreal—A. Baillargeon, 311 St. Denis St.—complete equipment for automobile repair shop.

Que., Montreal—C. Ledout, 23 St. Famile St.—complete equipment for the manufacture of carriage and automobile bodies, also for general and automobile repair shop.

Que., Montreal—E. Viau, 385 Sherbrooke St., E.—complete equipment for 15 stall garage and repair shop.

Machinery Wanted

Ala., Birmingham—Packard Birmingham Motors Co., 1010 Sycamore St.—machinery and equipment for proposed $300,000 factory, to replace that which was destroyed by fire.

Ala., Lanett — Bd. Educ. — vocational equipment for $100,000 school, including transmission, lathe, press, drill, saws and woodworking machinery.

Ga., Fitzgerald—Union Cotton Oil Co.—machinery for proposed $50,000 box factory.

Ill., Chicago—Chicago & Northwestern Ry., 226 West Jackson St., F. J. Berck, Genl. Purch. Agt.—machinery and equipment, including conveyors, hoists, etc., for coaling station at Evansville, Wis.; small tools, hoists and power machinery for proposed $300,000 roundhouse at Madison, Wis.

Ind., Anderson—Anderson Fdry. & Machine Wks.—equipment for new foundry.

Ind., Indianapolis—R. E. Castetter, Moore & Christian Sts. planing mill machinery and equipment, including planers, saws, tables, etc.

Ind., Winchester—W. McCamish Co. (job printer)—24 in. paper cutter.

Ia., Walker—E. J. Mills—newspaper press, paper cutter, belting, hangers and pulleys.

Kan., Blue Mound—Sun—power paper cutter, folder and other newspaper equipment.

Kan., Hutchinson—Carey Salt Co., E. Carey, Pres.—crushers, conveyors, belting, hangers and salt pulverizing equipment.

Kan., Wichita—Missouri Central Type Fdry., East Murdock St. (printers' supplies), W. W. Witt, Purch. Agt.—job printing press, power paper cutter, metal saws with power attachments, linotype and monotype machines (used).

Kan., Wichita—Seneca St. Planing Mill, 522 North Seneca St., (cabinet maker), V. McLaren, Purch. Agt.—power belt sander, also one Universal saw.

Kan., Wichita—Viaduct Print Shop, 411 East Kellogg St., D. T. Amishan, Purch. Agt.—8 x 12 in. power job printing press.

Ky., Junction City—Bd. Educ.—vocational equipment for $70,000 school, including drill, press, lathe, saw and wood-working machinery.

Md., Baltimore—Baltimore Paint & Color Wks., Frederick and Calverton Rds., M. Shuger, Pres.—complete machinery and equipment for the manufacture of paints (new).

Mass., East Boston (Boston P. O.)—Acme White Lead & Color Wks., Border St., address Purchasing Agent—hoisting and mixing machinery, etc., for the manufacture of paint.

Mass., East Boston (Boston P. O.)—F. Perone, 1085 Bennington St.—several washing and drying machines, also belting and shafting for laundry (new or used).

Mass., East Walpole—Bird & Sons, Inc. (roofing products)—conveying machine for new factory.

Mass., Fall River — Fyans, Fraser & Blackway Co., Anawon St. (textile machinery dealers)—one 2 cylinder Garnett machine with 20 in. cylinder, Hunter make; one Franklin process dyeing machine for 3 and 6 in. packages; Whitin spinning frame with 1⅛ in. ring, 2⅜ in. gauge, 224 or 306 spindles to a frame.

Mass., Stoughton—Meade Rubber Co., J. Meade, Genl. Mgr.—pulleys, shafting and leather belting, various sizes, for addition to plant (new or used).

Mich. Detroit—H. V. Babcock, 1968 Tuxedo Ave.—newspaper press, belting, hangers and linotype (used preferred).

Mich., Detroit — Flint-Dayton Co., 3432 Holcomb Ave. (contractors), W. T. Flint, Purch. Agt.—one master woodworker.

Minn., Ashby—J. M. Stene—creamery equipment, including testers, churns, weighing machines and shafting.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Steel contract prices advancing. Premiums, however, previously demanded for quick deliveries, are disappearing from the market due to falling off in demand and consequent increase in promptness of shipments. Shapes and plates quoted at $2.50@$2.75; bars, $2.40@$2.75 per 100 lb., f.o.b. Pittsburgh. Last week as high as $2.90 was named on some shipments of structurals, with $2.35 the minimum on bars. Less pressure in demand for plates. Mills reluctant to take on additional orders while deliveries are still behind on tonnages already booked. Sheet and tin plate price tendencies upward for third quarter business, due to uncertainty in costs. Openhearth spring steel up ½c. per lb. in New York; hoops, bars and shapes advanced 15c. and plates, 20c. per 100 lb. in Cleveland warehouses during week.

Declines—Coke and steel scrap cheaper. Copper market dull, down ¼c. per lb. in week. Lead dropped 1½c., despite heavy domestic consumption. Zinc market sagging; galvanizers and brass makers inactive. Dealers' purchasing prices of old metals, non-ferrous, down ¼c. per lb. since last week. Lubricating oil market soft; prices unlikely to go lower. Linseed oil situation easier.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.76
Virginia No. 2	34.17
Basic	30.75
Grey Forge	31.00
CHICAGO	
No. 2 Foundry local	33.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	32.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00
Cleveland	5.60@6.25
Cincinnati	4.00@6.00
New York	5.50@5.75
Chicago	4.00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.25	4.34	3.90	4.15
No. 12	2.75@3.35	4.39	3.95	4.20
No. 14	2.85@3.45	4.44	4.00	4.25
No. 16	3.05@3.65	4.54	4.10	4.35
Black				
Nos. 17 and 21.	3.35@3.85	4.70	4.55	4.85
Nos. 22 and 24.	3.40@3.90	4.75	4.60	4.85
Nos. 25 and 26.	3.45@3.95	4.80	4.65	4.90
No. 28	3.50@4.00	4.90	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.50	4.90	4.80	5.10
Nos. 12 and 14.	4.10@4.60	5.00	4.90	5.20
Nos. 17 and 21.	4.40@4.90	5.30	5.20	....
Nos. 22 and 24.	4.55@5.05	5.45	5.35	5.65
No. 26	4.70@5.20	5.60	5.60	5.80
No. 28	5.00@5.50	5.90	5.90	6.10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	62	50½	¾ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 to 8	56	43½	4½ to 6	28	13
9 to 12	54	41½	7 to 12	26	11
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	60	49½	¾ to 1¼	30	14
2 to 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	52%	39%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	49%	36%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 10%. Cast iron, standard sizes, 21½% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.69	4.66	4.55
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.66	5.80
Cold finished shafting or screw	4.20	3.90	4.30
Cold finished flats, squares	4.70	4.40	4.80
Structural shapes (base)	3.44	3.46	3.40
Soft steel bars (base)	3.34	3.36	3.32½
Soft steel bar shapes (base)	3.34	3.36	3.32½
Soft steel bands (base)	4.14	3.61	3.95
Tank plates (base)	3.44	3.71	3.40
Bar iron (3.25 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50	....	14.00
⅛	7.35	....	12.25
5/32 to ¼	7.10	....	11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			17.50
Tin, 5-ton lots, New York			44.00
Lead (up to carlots), St. Louis	7.80;	New York,	8.37½
Zinc (up to carlots), St. Louis	7.00;	New York,	7.45

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	28.00	28.50
Antimony (Chinese), ton spot	9.12½	11.50	9.50
Copper sheets, base	26.50	25.75	23.00
Copper wire (l.c.l.)	19.87½	22.00	16.25
Copper bars (l.c.l.)	23.75	25.25	19.50
Copper tubing (l.c.l.)	28.00	30.25	23.00
Brass sheets (l.c.l.)	21.75	25.25	18.75
Brass tubing (l.c.l.)	26.50	30.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (l. c. l.)	20.00	21.00	15.75
Brass wire (l. c. l.)	22.25	22.00	.....
Zinc sheets (casks)	11.00	11.25	.....
Solder (½ and ½), (caselots)	33.50	29.50@31.50	20.00
Babbitt metal (83% tin)	65.00	56.00	41.00
Babbitt metal (35% tin)	40.00	18.50	18.00
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	35 00
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	14.50@15.00	14.00	15.00
Copper, heavy, and wire	14.25@14.75	13.50	14.00
Copper, light, and bottoms	12.25@12.75	12.00	12.75
Lead, heavy	6.00@ 6.50	6.50	6.75
Lead, tea	5.50@ 5.75	5.00	5.75
Brass, heavy, yellow	8.50@ 8.75	....	9.00
Brass, heavy, red	12.00@12.50	12.00	12.00
Brass, light	7.00@ 7.50	7 50	8.00
No. 1 yellow brass turnings	8.50@ 8.75	8.50	8.50
Zinc	4.75@ 5.25	4.50	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.20	14.50
IC,	112 sheets	13.30	12.60	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.30	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.11@.11½	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	3.50	2.65
Roll sulphur, per 100 lb.	2.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.16	1.10	1.37
White lead, dry or in oil	100 lb. kegs.	New York, 14.50	
Red lead, dry	100 lb. kegs.	New York, 14.50	
Red lead, in oil	100 lb. kegs.	New York, 16.00	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$5.50@6.00	
Coke, prompt foundry, Connellsville	per net ton	7.00@7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅝ and smaller	60%	.....	.....
Semi-finished nuts, ¾ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ⅜ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ½ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50-10%	50%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Lard cutting oil (50 gal. bbl.) per gal.	$0.60	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1 40
Cloth	3.02	2.67	3.20

Minn., Pillager—Herald—complete newspaper equipment, including press and paper cutter.

Miss., Richton—Canal Lumber Co.—lumber mill machinery and equipment.

Mo., Aurora — Bd. Educ. — vocational equipment for $100,000 school.

Mo., Kansas City—Palmer-Chinn Letter Co., Room C, Rialto Bldg. (job printer)—Flexo typesetter.

Mo., St. Louis—G. C. Eschbacher, 3436 Osage St.—combination or light woodworking machine, work bench, tools, etc., for carpenter and cabinet shop (used).

N. J., Trenton—The State, A. B. Mills, Archt., State Office Bldg.—$7,000 worth of laundry machinery for New Jersey Sanitarium at Glen Gardner.

N. Y., Avon—New York Canners, Inc.—machinery and equipment for addition to canning factory.

N. Y., Buffalo—Amer. Radiator Co., 1807 Elmwood Ave.—equipment for proposed coal grinding plant.

N. Y., Buffalo—Buffalo Taxi Service & Sight Seeing Co., 218 Niagara St., J. C. Montana, Purch. Agt.—1,000 gal. gasoline tank and pump for station at 369 Niagara St.

N. Y., Buffalo—L. H. Holfelner, 1197 West Ave.—equipment for proposed bakery at 1160 West Ave.

N. Y., Buffalo—Iroquois Bag Co., Inc., 463 Howard St., R. Harris, Purch. Agt.—machinery and equipment for proposed small factory for the manufacture of burlap and cotton bags at 642 Clinton St.

N. Y., Buffalo—Quality Damp Wash Co., 706 Northland Ave.—machinery and equipment for proposed small laundry.

N. Y., Buffalo—Turner & Porter, 49 West Swan St.—one 8 x 12 in. Chandler & Price printing press.

N. Y., Cairo—Bd. Educ.—lathe, press, drill, saws and other vocational equipment for $70,000 school.

N. Y., Canandaigua—Bd. Educ.—complete vocational equipment for $200,000 school.

N. Y., Chenango Bridge—F. M. Harding—coal elevating and conveying machinery.

N. Y., Falconer—Reynolds Oil Co., E. B. Reynolds, Mgr.—equipment for gasoline and service station, also oil handling equipment.

N. Y., Holley—Holley Fruit & Cold Storage Co.—40 ft. compressor for new ice and cold storage plant.

N. Y., Hornell—H. L. Jones, c/o Tracey Jones, Inc., 71 Church St. (wood trim manufacturing plant)—woodworking machinery.

N. Y., Jamestown—L. E. Lownsbery, 100 Cook Ave.—air compressors, tankage and pumps for gasoline distributing station.

N. Y., Long Island City—Cornellist Textile Corp., 45 Jamaica Ave.—17 to 65 in. tentering machine (used).

N. Y., Newark—Newark Creamery Co.—power operated filling machinery for filling soft drink glass botties.

N. Y., New York—A. Loewy, 200 5th Ave.—trolley one beam hoist, 1 or 2 ton capacity.

N. Y., New York—F. J. Marr of the Industrial Maintenance Co., 44 West 15th St., wishes to correspond with machine shops who are in position to manufacture parts for automatic safety devices for elevator doors.

N. Y., New York—Nu-Method Matrix & Plate Co., Inc., 473-475 Broome St.—hoe matrix rolling machine, hoe pneumatic steam matrix tables, circular saw, nailing machine and 8 column flat casting box.

N. Y., Rochester—J. Strobel, archt., 52 Lake View Park—30 ton daily capacity ice making machine for cold storage warehouse at Charlotte.

N. Y., Salamanca—Fancher Furniture Co.—woodworking machinery and equipment for addition to plant.

N. Y., Tonawanda—Natl. Roofing Co., Fillmore Ave.—machinery and equipment for roofing plant, to replace that which was destroyed by fire.

N. Y., Westfield — Orsi Winery — wine making machinery and equipment, to replace that which was destroyed by fire.

N. C., Burnsville—W. J. Parnell—woodworking machinery and equipment for chair factory, including planers, stickers, surfacers, sanders and transmission machinery.

N. C., Leasburg—Bd. Educ.—vocational equipment for $80,000 school.

N. C., Lexington—Elk Furniture Co.—dove tailers, sanders, moulders, band and rip saws.

O., Columbus—Columbus Tire & Rubber Co., 555 West Goodall St., M. J. Miscal, Secy.—one tire building machine, capacity 250 tires per day.

O., Columbus—Pure Oil Co., Pure Oil Bldg.—machinery and equipment for proposed $250,000 addition to refinery at Ardmore, Okla.

O., Eaton—Washington Motor Co. (manufacturer of automobiles), E. C. Wysong, Vice Pres. and Genl. Mgr.—equipment for proposed plant at Middletown.

O., Greenville—W. H. Williams Co. (job printer)—17 x 24 in. cylinder drum press with or without motor.

O., Newton Falls—Newton Falls Rubber Co.—machinery and equipment for rubber products plant.

O., Newton Falls—Peebles Eng. Co.—foundry equipment.

O., Niles—Selin China Co., 110 Chestnut St.—machinery and equipment for the manufacture of china ware products.

O., Sugarcreek—The Budget (newspaper)—7 in. stitcher.

O., Tiffin—Advertiser Co., E. T. Rodgers, Purch. Agt.—newspaper press and stereotype outfit.

O., Youngstown — Dieter Dairy Co., Mahoning Ave.—machinery and equipment for proposed dairy, including conveying, washing, bottling machinery, etc.

Okla., Douthat — R. N. Morrison—oil pump, air compressor, belting and pulleys for oil filling station and garage.

Okla., Elk City—Williams & Miller Gin Co.—Lummus and Continental gin machinery.

Okla., Oklahoma City—L. Lester, 2 West Locust St.—newspaper press, paper cutter, belting and pulleys (used preferred).

Pa., Bedford — Independent Printers — 8 x 12 in. job press and lever press, largest size.

Pa., Burgettstown—Iron City Oil & Drilling Co.—Star drilling machine.

Pa., Chadds Ford—Bd. Educ.—vocational equipment, including lathe, press, drills, etc.

Pa., Chester—Bond Stationery Co., A. Bond, Purch. Agt.—Chandler & Price 8 x 12 in. electric press.

Pa., Christiana—Christiana Planing Mill—machinery, including saws, planers, slicers and conveying machinery.

Pa., Conneautville—Conneautville Dairy Products Co.—creamery and milk plant machinery and equipment, including transmission, conveying and purifying equipment, also mechanical separators.

Pa., Cynwyd—I. V. Woodbury—machinery and equipment for the manufacture of shoes.

Pa., Ferndale — Bd. Educ. — vocational equipment for $160,000 school, including lathes, presses, saws, tools, etc.

Pa., Hazleton—Hazleton Mattress Co.—machinery and equipment for mattress factory, to replace that which was destroyed by $65,000 fire.

Pa., Lancaster—G. A. Runkle, 121 Church St.—complete circular machine for knitting stockings.

Pa., Lewistown—Moller Motor Co.—machinery and equipment for proposed $50,000 automobile body factory at Hagerstown, Md.

Pa., Little Meadows—F. Williams—complete saw outfit.

Pa., Monessen—S. S. Jones, 30 6th St.—one vertical compressed air outfit for garage.

Pa., Morrisville — Bd. Educ. — complete vocational equipment for $120,000 school, including lathe, press, drill, woodworking machinery, etc.

Pa., Nanticoke—Susquehanna Collieries Co.—machinery and equipment for proposed $150,000 coal washery, to replace that which was destroyed by fire.

Pa., New Castle—Shenango Pottery Co., J. Smith, Pres.—pottery working machinery and equipment for the manufacture of tableware.

Pa., Oxford—Oxford Press (newspaper)—Omaha folder.

Pa., Phila.—A. Box & Co., Trenton Ave. and Ontario St. (manufacturer of elevators)—one gap riveter for ⅝ in. rivets.

Pa., Phila.—F. H. Heim, 3238 North 6th St.—bread and cake mixers, also bread trough.

Pa., Phila.—C. J. Kain, 3333 Malla St. (woodworker)—6 in. bench joiner, saw table and drill press.

Pa., Phila.—Logan Hosiery Co., 3213 Frankford Ave., F. Vitel, Purch. Agt.—drying machines, hydro extractors, ribbers, loopers, overlocks, etc.

Pa., Phila.—J. Manley Co., D and Luzerne Sts. (foundry)—one Baird rumbler machine.

Pa., Phila.—Pennsylvania Door & Sash Co., 25th and Callowhill Sts.—tenon machines, sanders, circular and bandsaws, drills, planers, etc., for new mill.

Pa., Phila. — Record Hosiery Mills, 179 East Roosevelt Blvd., P. Pleet, Purch. Agt.—Smith-drum rotary machine, knitting machines, ribbers, leggers, loopers and Merrow overlockers.

Pa., Spartansburg—Spartansburg Oil & Gas Co.—machinery and equipment, including conveying machinery for proposed $150,000 oil refinery.

Pa., Taylor (Scranton P. O.)—Imperial Cigar Co.—cigar making machinery and equipment for addition to plant.

Pa., Wampum—Wampum Milling Co.—machinery and equipment for large addition to feed mill on Kay St.

S. C., Gaffney—Bd. Educ.—vocational equipment for $150,000 school.

Tex., Dallas—Brown Cracker & Candy Co., 603 Caruth St.—$350,000 worth of machinery and equipment for $1,000,000 addition to plant.

Tex., Greenville—Bd. Educ.—vocational equipment for $125,000 school.

Tex., Olney—Bd. Educ.—vocational equipment for $85,000 school.

Va., Winchester — Winchester Woolen Mills—small woolen twisting machine for twisting from spools to bobbins.

W. Va., Beckley—Faith-Pocahontas Coal Co.—coal handling and mining machinery, including transmission and conveying equipment.

W. Va., Huntington—A. C. Love Co.—200 ton hydraulic wheel press for standard gauge equipment.

Wis., Ashland—J. Schroeder Lumber Co., Prentice Ave.—heavy duty power saws.

Wis., De Pere—De Pere Union Oil & Supply Co.—gasoline storage tanks and pumps for proposed service station.

Wis., Eau Claire—Winona Oil Co., South River St.—gasoline storage tanks, pumps, etc., for proposed service station.

Wis., Janesville—Champion Oil Co., 29 West Milwaukee St.—gasoline storage tanks, pumps and lubricating oil tanks for proposed garage and filling station.

Wis., Kaukauna—Union Oil & Supply Co., T. S. Cassel, Vice-Pres.—storage tanks, 15,000 gal. capacity, pumps, etc., for gasoline storage warehouse and pump house.

Wis., Kenosha—C. S. Judd, 570 Elizabeth St.—one traveling crane, about 25 ton.

Wis., Kenosha—Mantkus Motor Sales Co., 313 Park St.—gasoline storage tank and pump for proposed garage.

Wis., Kenosha—Simmons Mfg. Co., 160 Exchange St.—special machinery for proposed $350,000 factory for the manufacture of steel furniture.

Wis., Ladysmith — Bd. Educ., L. C. Streator, Clk.—equipment including woodworking tools, etc., for manual training department of proposed addition to high school.

Wis., Madison—J. O'Brien, c/o R. A. Phillips, Archt., 315 Beaver Bldg.—laundry equipment, including dryers for proposed apartment building.

Wis., Milwaukee—C. H. Beltmann, 1377 40th St. (carpentry and millwork)—one combination woodworking machine to perform several operations.

Wis., Milwaukee—Hotel Wisconsin Realty Co., c/o W. Schroeder, 86 Michigan St.—refrigeration machinery, ice machine, dishwashing machinery and laundry equipment, including dryers, for hotel at Madison.

Wis., Oshkosh—Bd. Public Wks., J. Voss, Comr.—small jointer, table saw, mortiser and glue pots for manual training department of Roosevelt School.

Wis., Sheboygan—Lincoln Plywood Co., South Water St., and New York Ave. (veneer products), A. H. Stringe, Purch. Agt.—dry kiln machinery and equipment, including hoists and planer.

Wis., Sheboygan—Sheboygan Mattress Co., 1214 Michigan Ave., J. Maisack, Pres.—machinery, including weavers, spinners, etc., for the manufacture of mattresses, to replace that which was destroyed by fire.

Wis., Sheboygan—C. Zelle & Sons Co., 1216 Michigan Ave.—woodworking machinery for proposed shop and planing mill, to replace that which was destroyed by fire.

Wis., Tomahawk—J. Oelhafen Lumber Co.—one large portable sawmill.

Wis., Washburn—Excelsior Products Co.—several excelsior making, also pad and baling machines; belting and shafting.

Wis., Wausau—I. Edwards—newspaper press, paper cutter, pulleys and belting.

Wis., Westford (Beaver Dam P. O.)—Westford Sun Rise Dairy Co., c/o E. M. Fromholz—power churns, separators, belting and shafting.

Alta., Edmonton—W. P. Hinton—complete equipment for extraction and tar refinery at McMurray.

Ont., Belle River—J. Cooper—equipment for new $50,000 brick and tile plant.

Ont., Bigwood—Marathon Lumber Co.—medium surface wood planer, endless bed, double surface preferred.

Ont., Boakview — Begans & Simpson — sprocket wheels for lumber conveyor, conveyor chains and equipment.

Ont., Hamilton—Stanley Steel Wks. of Canada, Ltd., Arthur St., A. Hatch, Mgr.—equipment for proposed $100,000 additions to plant.

Ont., Hespeler — Wood Specialty Co. — woodworking equipment for proposed $60,000 addition to plant.

Ont., London—Starr Phonograph Co., 265 Dundas St., J. A. Croden, Mgr.—equipment for proposed $50,000 plant.

Ont., Monteith—Hawk Lake Lumber Co.—log conveyor, circular saw outfit, carriage, resaws, edgers and pulp rossing drum for saw mill at Wasach.

Ont., Pelee Island—N. McCormick is interested in a syndicate—special equipment for the development of graphite deposits.

Ont., Sault Ste. Marie—Soo Lumber Co.—woodworking machinery for proposed addition to lumber mill.

Que., La Tuque—Brown Corp., G. Bosswell, 19 St. Genevieve St., Quebec, Purch. Agt.—machinery and equipment for pulp and paper plant at St. Angele de Laval.

Que., Montreal—Montreal Quarry Ltd., 800 Belchane St., E. La Belle, Purch. Agt.—additional quarry machinery.

Que., Montreal — J. E. Rochon, 1150 Belchane St. (sash and door factory)—additional woodworking machinery.

Metal Working Shops

Ala., Birmingham—The Packard Birmingham Motors Co., 1010 Sycamore St., plans to rebuild its factory, which was recently destroyed by fire. Estimated cost $300,000. Engineer or architect not announced.

Ala., Montgomery—The Atlantic Coast Line Ry., A. C. L. Bldg., Wilmington, plans to build shops, here. Estimated cost, including machinery, $450,000. J. E. Willoughby, Ch. Engr.

Calif., Los Angeles—The Biltmore Garage Corp. awarded the contract for the construction of an 8 story garage on Olive and 4th Sts.

Calif., Los Angeles—D. E. Foster, c/o G. G. Stewart, Contractor, Lissner Bldg., awarded the contract for the construction of a 1 and 3 story store and garage building on Maryland Ave. Estimated cost $150,000.

Calif., Oakland—The Foster & Kleiser Co., 287 Valencia St., San Francisco, awarded the contract for the construction of a 1 story warehouse and garage on Market and 22nd Sts., here. Estimated cost $40,000. Noted Jan. 18.

Calif., San Francisco—G. Becker, 1233 Bellevue Ave., Burlingame, will build a 1 story ornamental iron and bronze works on Dore St. near Howard St., here. Estimated cost $10,000.

Calif., Taft—The Taft Union High School Dist., is having revised plans prepared for the construction of a group of high school buildings, including auditorium, gymnasium, science and shop buildings, also additions. Estimated cost $350,000. W. H. Weeks, 369 Pine St., San Francisco, Archt. Noted Mar. 29.

Conn., Hartford—The Brown Thomson Co., Main St., has had plans prepared for the construction of a 1 story, 80 x 100 ft. garage. Estimated cost $40,000. I. A. Allen, Jr., Inc., 100 Farmington Ave., Hartford, Archt.

Conn., Hartford—The Tuska Electric Co., 69 Bartholomew Ave., is having plans prepared for the construction of a 2 story, 30 x 70 ft. factory on Homestead Ave. Estimated cost $45,000. Greenwood & Moerr, 847 Main St., Hartford, Engrs. and Archts.

Conn., New Britain—Landers, Frary & Clark, Commercial St., are having plans prepared for the construction of a 3 story addition to cutlery plant. Estimated cost $65,000. M. J. Unkelbach, 162 Main St., New Britain, Archt.

Conn., Southington — The Southington Hardware Co. awarded the contract for the construction of a 2 story, 50 x 110 ft. factory. Estimated cost $60,000. Noted Apr. 19.

Conn., Torrington—The Union Hardware Co., 535 Migeon Ave., awarded the contract for the construction of a 3 story, 100 x 180 ft. addition to its factory. Estimated cost $150,000. Noted Nov. 30, 1922.

Conn., Waterbury—The Connecticut Co., 127 Church St., New Haven, is receiving bids for the construction of a 2 story 46 x 156 ft. operating building, 1 story 205 x 370 ft. car barn, 40 x 177 ft. bus garage and a 40 x 100 ft. sand house on West Main St., here. Estimated cost $450,000. H. D. Stamm, c/o owner, Archt.

Mass., Everett (Boston P. O.)—E. Dana, Genl. Mgr. of the Boston Elevated Ry., 108 Massachusetts Ave., Boston, will receive bids until May 7 for the construction of the superstructure of 2 story, 150 x 360 ft., 170 x 360 ft. and two 52 x 53 ft. shop buildings, here. Estimated cost $500,000. H. M. Steward, c/o owner, Engr.

O., Cleveland — The Broadhead-Garrett Co., 2835 East 51st St., is receiving bids for the construction of a 300 x 360 ft. warehouse, 40 x 40 ft. dry kiln, 40 x 50 ft. planing mill, also boiler house, office and garage building on East 71st St. along tracks of Belt Line R.R. Estimated cost $200,000. J. C. Rash, Asst. Secy. Best & Hoefler, 6523 Euclid Ave., Cleveland, Archts.

O., Cleveland — The Western Reserve Fdry. Co., c/o L. G. Wagner, Genl. Mgr., 1209 Marquette Ave., has had plans prepared for the construction of a 1 story, 90 x 180 ft. foundry. Estimated cost $60,000. Private plans.

Pa., Brownsville—E. Meyer is receiving bids for the construction of a 2 story, 57 x 90 ft. garage. Estimated cost $40,000. H. W. Altman, Fayette Bldg., Uniontown, Archt.

Pa., Ebensburg — The Gardner Calculating Machine Co., High St., is having plans prepared and will open bids about May 15 for the construction of a 2 story, 90 x 100 ft. factory for the manufacture of adding machines and parts. Estimated cost $60,000. C. Gardner, Pres. J. L. Elder, Ebensburg, Engr. and Archt.

Pa., Mount Lebanon—R. E. Murray, Archt., 401 Washington Rd., is receiving bids for the construction of a 2 story, 86 x 115 ft. garage on Washington Rd., here, for M. A. Haller, 217 Trenton St., Pittsburgh. Estimated cost $40,000.

Pa., Phila.—Ballinger & Co., Archts., 12th and Chestnut Sts., are receiving bids for the construction of 1 and 2 story machinery mill buildings on Wyoming and Stenton Sts. for the Apex Machine Co. Estimated cost $500,000.

Pa., Philadelphia—C. J. Mitchell, Archt., 15 South 21st St., is receiving bids for the construction of a 1 story, 50 x 114 ft. garage at 4538 Merion Ave., for A. Powers, c/o Archt. Estimated cost $75,000.

R. I., Providence—B. S. D. Martin, Archt., 86 Weybosset St., is receiving bids for the construction of a 1 story, 75 x 100 ft. garage on Elmwood Ave. for F. D. McKendall, c/o Architect. Estimated cost $50,000. Noted March 22.

Tex., Dallas—Sutton, Steele & Steele, Inc., Forney Ave., has had plans prepared and will receive bids in about 90 days for the construction of a 1 story, 100 x 350 ft. steel mill. Estimated cost $125,000. O. Steele, Engr. and Supt.

Wash., Seattle—H. Disston & Sons, Inc., 322 Occidental St., plans to build a 120 x 150 ft. factory for the manufacture of saws. Estimated cost $60,000.

Wis., Fox Lake—The Fox Lake Auto Co. is receiving bids for the construction of a 2 story, 64 x 85 ft. garage. Estimated cost $40,000. Peacock & Frank, 445 Milwaukee St., Milwaukee, Archts. Noted Apr. 19.

Wis., Green Bay—The A. Libert Machine Co., 324 Roosevelt St., is receiving bids for the construction of a 1 story, 55 x 100 ft. machine shop. Estimated cost $40,000. Private plans.

Wis., Hurley—The Norman Motor Co., 51 3rd Ave., plans to build a 2 story, 50 x 135 ft. garage and repair shop on Main St. Estimated cost $40,000. B. E. Norman, Pres. Engineer or architect not selected.

Wis., Kenosha—White & Co., Archts., Public Service Bldg., are receiving bids for the construction of a 1 story, 64 x 125 ft. garage on Elizabeth St. for the Mantkus Motor Sales Co., 313 Park St. Estimated cost $40,000.

Wis., Madison—J. Petersen, 102 South Orchard St., is receiving bids for the construction of a 2 story, 99 x 127 ft. garage and repair shop. Estimated cost $40,000. Private plans.

Wis., Madison—J. E. Teckemeyer, 807 University Ave., awarded the contract for the construction of a 2 story, 36 x 70 ft. service station. Estimated cost $40,000. Noted Mar. 22.

Wis., Madison—The University of Wisconsin, Administration Bldg., plans to build a 1 story, 75 x 90 ft. addition to its machine and metal shop. Estimated cost $83,650. M. E. McCaffery, Secy. Engineer or architect not selected.

B. C., North Vancouver—The Burrard Dry Dock Co., c/o Wallace Shipyards, Ltd., 850 Hastings St., W., will build a floating drydock of 15,000 ton capacity; a 700 ft. outfitting pier, 50 ft. wide; a 60 x 250 ft. machine and plate shop; blacksmith shop; power house; store, office and hospital buildings. Estimated cost $3,750,000.

B. C., Vancouver—The Canadian Pacific R. R., Canadian Pacific R. R. Depot, will receive bids about May 13 for the construction of 1 story car repair shops at the foot of Drake St., to replace those which were destroyed by fire. Cost between $80,000 and $100,000. F. W. Alexander, Engr.

Ont., Hamilton—The Canadian Westinghouse Co., Aberdeen Ave., plans to build large additions to its plant. Estimated cost $1,000,000. P. J. Myler, Pres.

Equipment
Employment
Business

OPPORTUNITIES

You'll find the very latest in the machinery field in this issue

See Pages 177-193

SEARCHLIGHT SECTION

See Pages 177-193

Help Yourself

to your share of this

$400 Prize Money!

HERE'S YOUR CHANCE! Make up your mind to win one of these prizes! Cash in on your own experience, or that of some shop with which you are familiar. Tell us in your own way:

"How a shop saved by replacing old shop equipment with new equipment"

HUNDREDS of shops are waking up to the fact that it's good business to buy new machine tools for *replacement* as well as for simply expanding plant facilities.

Write us the story of one case where money was saved by installing new, up-to-date equipment in place of uneconomic machines that have served their time. Make it any length, from 100 to 1,500 words, just so it tells the whole story. Follow rules below—and you'll be in the race for one of these prizes:

1st Prize *$200.00*
2nd Prize *100.00*
3rd Prize *50.00*
Five Prizes—each $10.00

(*All other entries considered worthy of publication will be paid for at regular editorial rates.*)

The judges are A. L. De Leeuw, Consulting Engineer and Consulting Editor, *American Machinist;* W. F. Dixon, Works Manager, Singer Mfg. Co., Elizabethport, N. J.; K. H. Condit, Editor, *American Machinist.*

Don't Put It Off!

The Contest is now open. Get busy on your prize story at once—send it in as soon as possible. Jobs that are put off seldom get done.

How much of this $400.00 will be yours?

RULES
of American Machinist Prize Contest

1. Contest open to all, whether A.M. subscribers or not, *except machine tool manufacturers, dealers, salesmen, or others interested in sale of the equipment described.*

2. No entrance fee charged.

3. SUBJECT—"How a shop saved money by replacing old machine tools or other shop equipment with modern equipment."

4. Account must be *bona-fide* story of actual occurrence.

5. Must be *specific,* giving full particulars, including trade name or maker's name of new equipment purchased.

6. Photos, sketches, blue prints, etc., are desirable and accepted if needed to illustrate story.

7. Contestants may send in more than one entry if desired but if so, each must be mailed separately.

8. Any story submitted, and not a prize winner will be paid for at regular rates if it is considered suitable for publication.

9. Address entry to "IT PAYS TO REPLACE" Contest Chairman, American Machinist, 10th Ave. at 36th St New York City.

10. Contestant to write his name and address, position and shop where employed, on sheet of paper clipped to his entry—not on entry itself.

11. CLOSING DATE—All contest entries must be in the office of the American Machinist, or must bear postmark, not later than midnight, Thursday, July 5, 1923.